OPTOMETRIC · EXTENSION · PROGRAM · 1928

OEP

DEVELOPMENTAL VISION

D E V E L O P M E N T A L   V I S I O N

A series of papers released by the Optometric
Extension Program to its membership.

December, 1950 - September, 1951
G. N. Getman, O.D.
October, 1957 - September, 1959
G. N. Getman, O.D. & N. C. Kephart, Ph.D.
October, 1959 - September, 1960
G. N. Getman, O.D.

Compiled and Published by
Optometric Extension Program
Duncan, Oklahoma
1961

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

PYRIGHT 1950 ☆ OPTOMETRIC EXTENSION PROGRAM ☆ DUNCAN, OKLAHOMA

December - 1950 Vol.1 No.3

This is the third paper in this series, and herewith the series changes drivers. We are indebted to Dr. Crow for his first two introductory papers which appeared in October and November. The resume of the activities in optometry which have led to its present stage of growth are ably presented by Dr. Crow. His observations, participations, and contributions through the past twenty years have done much to put optometry in the position to aid, guide and care for the vision of children as no other profession can do. Thus, his role in the visual studies at the Clinic of Child Development at Yale was almost predetermined. His unique ability to read the visual records of the children at all ages brought much to the research and was the catalyst that made much of the retinoscopic research, which came later at Ohio State University, fruitful and purposeful.

It is appropriate and fitting that Dr. Crow should provide the introduction to this new series of papers. Our sincerest and deepest thanks to him.

The path that led to a combination of optometric and child development studies is interesting and significant. The circumstances which evolved into this combination need recounting so all in optometry may better realize how, as well as why, there should be interest in children.

At the Clinic of Child Development, the study of the visual development of the School age children from five to ten years of age was being explored through the visual skills examinations as early as 1940, and in 1943 the complete refraction examination was included, but the preschool ages had yet to be investigated.

In May of 1945 the authors were at Baltimore, Maryland, to recheck by examination and interview the 100 children of the Myopia Project. This was six months after the trainees had completed their training sessions. As would be natural, there were many discussions of the changes in the visual and the total behavior of the children, as well as of observations each of us had made in the office or clinic situations.

One particular incident which occurred at this time seems important to relate. Three and 1/2 year old Tom Getman had accompanied his parents on the trip to Baltimore, and while he was visiting with Miss Bullis, he was presented with the incomplete man test in which the body is drawn with an opening at the neck. He seemed a little confused by this open space so he was asked what he thought it was. "A door" was his reply. Sometime later Tom was presented with the Landolt Broken Ring test for acuity. He could tell where the space was down to the 20/100 line, but could go no farther. However, when asked to show where the "door" was, he promptly continued to the 20/25th line, without further questioning. This led us to recognize that children could not be reached through the adult standards of test procedures. His responses were determined by his own interpretation of the test situation, and could not be measured validly without recognizing his level of performance.

In the further analysis of the Baltimore Project, the most observable result was the improved performances of the trainees. Miss Bullis learned through her interview that the children were aware that their performance in school studies was easier. Many were not only showing improvement in sports ability but some were entering into such activities for the first time. There was an increase in interest in other children which led to the development of new social activities. The Wilmer Institute referred to this change as "psychological" improvements, and did not associate the change with vision. If by "psychological" was meant improved eye-hand co-ordination, spatial relationships, and social relationship rather than just an attitude toward the visual deficit, their conclusions were valid and favorable. The fact remains that the visual patterns brought to the project by the children were so altered by the training that they not only

could "see better" but could perform more easily and in wider areas. Vision had, to the extent possible for each individual, regained its pilot role.

For Optometry, the Baltimore Project was a valuable and informative experience. If there had been no gains in acuity or in the reduction of myopia, the improved visual performance in itself justified the project.

The analysis of all the results over and above "acuity" made us further aware of the needs for better understanding of what vision really is. The role of vision in the total performance of children, so undeniably produced at Baltimore, now put us into the search for those aspects of vision heretofore not admitted, but felt and, subconsciously at least, used in clinical practices and procedures.

Naturally we began to think that if we could combine our knowledge of child development and vision, some of these answers might be found. One of us was interested in children within the strictest clinical areas, of helping them solve their immediate visual problems. Seeing children clinically who had already acquired a visual problem was creating a dissatisfaction because of the lack of background material and knowledge of vision in children. The need to relate the child to the visual situation seen in the office was deeply felt. The other of us was interested in observing the growth of children and in the delineation of the development at periodic stages. It had been felt that if the developmental stages could be brought into sharper focus through the investigation of vision, a further dimension would be added to our knowledge of the growing child.

Skills tests were being used in the research at the Clinic of Child Development as early as 1940, and Miss Bullis spent considerable time before Baltimore trying to find the relations of skills, not only to the normally developing children, but also to those who were not meeting the school requirements for learning the three R's. She spent a summer with Dr. Mary Jane Skeffington examining the visual skills of the children attending the reading clinic at Washington University.

Dr. Getman, having used skills test extensively in office routines, went to Baltimore with appreciation of the skills tests, and it was found that we had noted many phenomena that we could feel were significant but which we could not relate to the specific demands of the test situations. Through our discussions we became aware of the monocular-binocular relationships and the influences of the stereoscope artificiality upon the child. Dr. Getman returned to practice and attempted the analysis of skills tests to try and find the reasons behind the observations of behavior discussed.

Our separate attempts at understanding the responses to the skills tests gave us a better understanding of what we needed to explore further. The fact that the child under eight years of age did not meet the artificial binocular demand created by the standard stereoscope made us realize that if we were to know the basic process of vision at the lower ages, we must first investigate it through the monocular-binocular aspects of the process. How to observe a natural binocular performance and at the same time the monocular response was the problem.

To better understand the vision of the school age child we needed to know the development during the preschool years. So in 1947 we were fortunate enough to have an opportunity for this research. At this time Dr. Getman made the first of his periodic visits to the Clinic. We examined children from 21 to 48 months of age with follow-up examinations six months later. The results of this research have been published in Vision, Its Development in Infant and Child.* This volume also contains the results of the visual examinations made by Dr. Vivienne Ilg of the children from five to ten years of age.

So optometry was furnished a valuable opportunity to participate in the research which gives the first account of how a child learns to see. Optometry has long maintained that seeing is a learned act. True, the mechanism must be there in healthy entirety, but its presence alone does not assure the ability. As a background for the papers to follow it seems worthwhile to recapitualte and consider these early processes of visual development.

The test situations as administered in this research at the Clinic were first presented to children from 36 to 48 months of age. The methods and the sequence as well as the test situations were determined by the child's acceptance and responsiveness. It was necessary to find a procedure that would be equally acceptable and comparable at all preschool ages. Likewise the proper techniques for the management of the examination

* Published by Paul B. Hoeber, Inc., New York, 1949.

were formulated. These included the physical set up as well as the instrumentation, the personnel, and the proper questioning according to age level. As the examination conditions were thus determined, suitable tests found, and the sequence set, the research was continued with children from the ages of 21 to 48 months of age.

Observation of the children during the tests, analysis of their responses - visual, postural and verbal - resulted in the delineation of developmental vision for the preschool ages.

Visual awareness, the recognition of objects or their spatial location is not a simple activity that just happens. Rather it is the result of a dynamic process that has its beginning at birth and continues through a lifetime. In all psychophysiological existence there is constant change and development. Likewise, in vision the change and development is constant. Vision, in the wakeful, mentally competent human is never static. Its dynamism is ever present - in extreme youth or extreme age. In the aged the change is slow and difficult to gauge. In the young child the change is like a loosened pendulum. It has its usual and expected pathway, but the arc is wide and manifold. In its width and variation the numerous and complex aspects can be delineated. Thus the study of children lets us examine vision step by step, part by part, process by process, phase by phase, and provides an insight never before obtained. The intricacies of the totality are taken for granted, and we easily and offhandedly speak of Vision - one breath and two syllables!

In the early stages of development, vision appears to be a fleeting, intermittent and discontinuous performance. But patterns may well be observed in the roving, non-focused eyes of the tiny infant that are significant to the organization of his visual skills. The seeking, roving eyes of the infant suddenly mobilize and appear to focus on some nearby person or bright area. As he is thus mobilized by vision, what have seemed to be random movements of body, arms and legs, now become more patterned. Even at a very young age we can observe the close relationship of vision and posture, and that vision plays a leading role. The Tonic Neck Reflex appears, and now the eye-hand behavior forms a relationship. The tongue, the hands come in to enhance and support vision. The support of hand is released, and vision takes over, due to its ability to cover more ground with greater speed than hand.

Dr. Bing-Chung Ling's study of sustained fixation shows that it occurs shortly after birth and occurs at near and develops toward far. Monocularity occurs in the process of the development of fixation, and yet the nascency of teaming is already present. It will take years before this reaches maturity. There is appreciation of distance and depth long before a rhythmic alternation of ocularity can be determined. During this time the far point is being extended, by thrust and withdrawal. The development of teaming continues, but not in an orderly alternate sequence. Right eye may fire five times to ever one time for the left, or vice versa. There will be differences in the performance at near and at far. By 42 months we can observe teaming and unity present in a higher degree but still binocularity is not yet fully developed. Where earlier fixation and inspection of the visual clue lasted a measurable second or two, now the act is completed in a fraction of the original time. Next, the alternation that was so evident begins to overlap and at times both eyes may simultaneously participate. There is still evidence of the alternation but this same shift, which a short time ago seemed so unpatterned and aimless, now seems to be the willful attempt of the novice to utilize this pair of visual organs he has inherited. The reach into space continues, and the far point of visual operation extends. In this growth and development of vision, there comes an appreciation of sizes, distance, tops and bottoms, shapes, and in all things outside of self - also, there develops the realization and awareness of position. Position of self and the position of surrounding objects in space to self. Visual space extends outside the field of view, behind self as well as beyond the horizon. Through all the complexity, the measurable facets of vision become enhanced and co-ordinated. Visual skills develop and advance, scope and facilities increase. Vision which started with almost separate entities, has become a unit that is greater than the sum of its parts by reason of its flexibility, durability, and mobility. It assumes the leading role in the hierarchy of the senses.

Thus the child develops vision and in the course of normal development is preparing to adapt himself to his culture and to operate satisfactorily within it.

The observations and findings of the visual performance of the preschool ages gave a new orientation to the understanding of vision. This helped to clarify some of the earlier unexplainable responses which were observed in the skills examinations and in retinoscope measurements. It could have been predicted from our knowledge of child development that we would find significant visual patterns at each age level. What we did not expect, but did see, was the dynamics of the visual mechanism during performance - the performance of the total child.

The four years of this aspect of the research were all too short, but it was of inestimable value in pointing the way toward the fuller understanding, not only of preschool children, but of the total visual performance. That there is need to carry on more extensive research along this line and to include as well, the deviations which occur, is obvious. It is possible, however, with our present background, to apply the results of these findings to the clinical procedures and interpretations in the optometric office.

The application of these findings which can now be made to school age children is of great value because so many children are seen after starting school instead of during the preschool years. The children, five, six and seven years of age, present so many interesting visual situations, and it is in these ages that a better understanding of "where they came from", visually, is so important. The cycles and phases of visual development are so significant that the optometrist should be very aware of the possible antecedent visual performance and its bearing on the child's present status as a first or second grader. Further, the need for a second examination on the same child, six weeks or three months later, may very well alter the course of care and guidance. First examination decisions might not have been as helpful to the child as would be possible with the fuller information of the added observation of the second visit. There is a time when a lens will do more for the child, and progress can be more clearly defined if his phase of development is considered.

Knowledge of developmental levels will influence the application of lenses or of training and will permit the child to use the assistance as a tool for his visual demands. If optometric procedures are not useful <u>to the child</u>, little or no progress can be expected.

Several studies have shown that during the first five years of school the most visual problems are created, and if we can know what the visual performances are within these years, the impact of the demands may be better handled through visual care.

At the present time the authors are working together at Dr. Getman's office. No formal research program has been established. The office routine will continue as in the past, and this will provide the material for the succeeding papers. The papers will be informal and we hope informative. We will present clinical procedures, or techniques, or methods that are useful to our understanding of the patient and his needs. Case histories or discussions of some aspect of visual interpretation may well seem pertinent. In this way we hope to interest you in exploring and joining with us in our search for greater knowledge of the child and his visual problems.

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

DEVELOPMENTAL VISION

January - 1951 Vol.1 No.4

The observations and investigation of vision, its development and patterning brought many new understandings to us. We had only been working with the preschool child for a year when we realized that many of the phenomena we were seeing not only had sequence and pattern, but could give us insight for adult visual performance. Almost the very first observation which led us into further consideration of the adult, was the manner in which the small child handled monocular projections. We used a very simple stereoscope with a picture of a little girl as the target. A white piece of paper was placed in the other half of the slide holder and the child was asked to touch the little girl's nose. The child's judgment of spatial location of the target was easily observable because, in the attempt to touch the girl's nose, he showed us where he thought the target was in front of him. When the child pointed to the eyepiece of the stereoscope, we felt certain that he was localizing the target as nearer - at a near point. When the child attempted to push hand through the slide holder to a point beyond the target, he was localizing the target as farther - at a far point.

Thus we saw the preschool child working through space via visual judgment of apparent location of the target on a line from self outward - Dr. Harmon's Z axis. We could not as yet reinterpret into phoria indications because it was purely an in-out, near-far manifestation. However, if we did observe the child localizing as though the target were behind the stage, this certainly fitted into our thinking regarding space judgments of the adult who shows us an exophoric localization on monocular projections. In reverse, if the child localized the target as nearer than the stage as when he pointed to eye piece or midway between eye piece and stage, we could see in it the esophoric localization of the adult on monocular projections. The child used the Z axis and the adult uses the Y axis (horizontal), as well as the Z.

Although in this paper we are describing similarities in performance of the child and the adult - the differences as above described are of importance when dealing with children. The processes of vision which can thus be investigated are so basic to all ages that now we can uncover them and see them in operation.

These processes differ in timing and in magnitude from birth to old age, but they are the modus operandi of seeing in the human being. This fact has let us add to our knowledge of vision through study of the child. The chart on the Visual Complex - page 165 of <u>Vision</u> was the result of the processes we could observe in the child and the projections and applications into adulthood of these same processes.

Analytical Optometry has long realized that the presbyope was progressed through time to the point where functional patterns are quite different than previously. The high exophorias can many times be violated in computing nets at near and many cases demand more plus than strict nets would allow. In the consideration of the preschool child, it is interesting to note a similarity and contrast to the prepresbyope. Perhaps it can be described thus: The prepresbyope is out of pattern through time, while the preschooler is not yet in pattern because of time. The visual mechanism through the years of 9 or 10 to 40 in the majority of cases fits the proper analytic handling of the case. The ages from 40 years on can be handled with greater consideration of bench optics and the physics of light. The ages before 9 or 10 must be approached on the basis of what a lens does within perceptual responses with de-emphasis of light physics. Thus our interest in these preschool ages leads into the development of vision from early infancy. The consideration of early behavior and performance of the child in all activity brings much to a better clinical handling during the years when patterns are not yet so es-

tablished that analysis and case typing can be the sole guide.

The presbyope has usually been easily handled because he is an adult and our optometric background deals in adults. We in Optometry have had an area of experience which let us approach the presbyope because we could see the course of presbyopia through the late 30's and early 40's.

We have not had this experiential background for preschoolers or even for the school child. Not seeing them clinically gave us no frame of reference and so we naturally attempted to grade them as "little adults." Not ever having been an adult, the preschooler just couldn't meet the demands of the adult measurements and tests and we too often found "defects" and "things wrong." It is impossible to reverse time and just as impossible to reverse development - therefore, the better understanding of the development of vision in the first five to eight years will give us the background we need for the clinical approach to children.

It is too easy for the reader to assume that these papers on developmental vision will apply only to those men seeing children. Let us realize now: Development is a constant factor from delivery room to casket. Visual adaptations to physiological changes are necessary to continued achievement and performance regardless of age.

The similarities of preschooler to prepresbyope are very interesting, and, in our office conferences, many references have been made to the observable phenomena that are present in both.

In this office much use of hook-overs is made in assisting the prepresbyope. A bifocal is a pretty rigid tool and we see many people who do not seem fluid enough to manipulate it constantly. Others in the early 40's show the need of near plus part time or for specific tasks even though amplitude is still around 3 diopters. These are not always B2 cases either. The use of these hook-overs has shown us some very interesting changes in pattern - some patients build increased amplitude using the hook-overs and then can go a couple of years without a bifocal. Others lose amplitude and need the bifocal sooner or at least will accept and use it with comfort and satisfaction.

We know from the studies made at the Clinic of Child Development that the child builds his visual space world from self outward. In the course of the normal development of vision we have observed at least two distinguishable individual types of children. One, the child who gets too far out in space visually and cannot get back to near, and two, the child who gets stuck at near and cannot get out to far. The use of a plus lens in both cases may allow the child to manipulate his visual space more satisfactorily.

Even though there seems to be opposite reasoning here, i.e., the plus in one case helps the child get out in space while in the other the plus lets him get back in, the primary difference between the preschooler and the prepresbyope seems to lie in the scope of space for each. The preschooler manipulates space in a linear fashion - almost a direct line from self to object. It is as though there is no stereoscopic vision within the act, and the stereoscope is not a stereoscopic instrument to him; it is more a control of the early binocularity which we labeled "binocularity" in Vision - binocularity with monocular stereopsis. The adult handles space with all the interpretive scope at his command. To him the stereoscope is a stereoscope and is a control of stereopsis within its instrumental limits. Here we have binocular stereopsis as a part of the adult's binocularity which allows him to project axes X, Y and Z into a monocular projection test.

Since the child is operating primarily on the Z axis, is it possible that in the first case the plus moves the child out in space perceptually so that now near is "not so near"? And, in the second case, is it possible that the plus extends space perceptually so that near is "not so near"?

Let us return to the early presbyope - wouldn't the same theorizing possibly account for the difference in results of the hook-over prescription? The one who uses the hook-over and builds more amplitude might have perceptually moved out into space so near is "not so near" and the other who settles into the bifocal has moved space out so near is "not so near"?

We intentionally theorize with question marks here because we do not have the answer but the similarities are great enough and frequent enough that we can't help wondering. We have observed dulling and brightening of the retinoscopic reflex in the prepresbyope - not to the same degree, and not at the same

speeds - just as we are seeing it in the preschooler. The preschool age and the pre-presbyopic age contrast most because of time. Each is a period of visual development and adaptation differing on the time scale.

We write about preschoolers by writing about presbyopes but if "ontogeny recapitulates phylogeny" then the problem introduced by time (age) should let us observe the reoccurrence of developmental pattern phenomena. Furthermore, if we can see the processes within the patterns of developing presbyopia, we might better see the processes within the patterns of the developing child.

Perhaps we can even carry this a bit farther by now, looking back to the preschooler again. Chavasse has stated, "In infancy and early childhood, the binocular "reflexes" (defined as physiological dynamic reactions) are in a state of diminishing flux. This period is coming to an end at 5 years of age and is ended by 8 years. Someone has coined the cliche, "life begins at 40". Maybe the visual patterns of these ages fit these two statements.

Chavasse states further that "binocularity can very easily drop out at the age of two years unless it has some assistance or guidance. At 3 years it becomes quite well grounded but would suffer greatly from disuse. At 4 years disuse of binocularity causes deterioration but not extinction. At 5 years it is possible to have a temporary deterioration of binocularity from disuse but by 8 years, it will be quite well fixed and stable."

This sequential description interests us very much because we have observed in the studies at the Clinic of Child Development, how deviations at these ages might well result in the above described manner. Since we have used the prepresbyope as our comparative age range, let us see what happens there. If 40 years is our starting point, by 42, near point achievement can and does frequently drop out. We have found that at this age, if plus for all distances (not a bifocal - not just full near plus) is prescribed, then near point achievement is enhanced and many times much more than we would expect - i.e., the +.50 for all wear brings up No. 19, increases No. 20 and No. 21, increases nets and even plus acceptance at far.

At 43 years, we see amplitudes down and the patient reports, "I would read more if it was easier". The plus prescribed for all distances and/or the +.50 hook-over allows more use and the "suffering from disuse" is eliminated with observable gain in No. 19, etc.

At 44 year, the patient reports "I've quit reading but have no trouble otherwise", and we see amplitudes at around 2 diopters. There has been even further deterioration through disuse and now the +.50 or +.75 hook-over just for reading regains near achievement and although there are not the total pattern improvements of more plus in No. 7, higher nets, etc., at least No. 19 does not drop clear off and become "extinct" in Chavasse's words.

At 45 years the processes of deterioration are not as easily cataloged because now there are more individual differences or perhaps more demands upon the individual. Now usually the patient reports, "I must have some help, my arms are not long enough for the telephone book, but I'm all right on the news and the comics". Now maybe it is necessary to bifocal the patient or to give reading glasses, but there is still temporary, or let us say, situational deterioration of the function.

At 48 years - just as at 8 years - the binocularity is established; the near problem is established and the patient reports, "I can't see anything up close any more". Now the hook-over is not satisfactory because it is "always in the other room." Now the bifocal is the useful tool it was intended to be and since the process has run its course, the bifocal is a solution.

Of course, the ages 42 through 48 years as used here are descriptive, and individual differences, task, and occupational demands can and do vary the age influences, but the process is the same and that seems very important.

As we write these papers entitled "Developmental Vision", we would like to gain certain ends. Our primary goal is to convey to the readers what the processes of vision are and when, where and how to see and utilize them. We cannot as successfully deal clinically with the child until we know the processes of vision. The adult tests and measures won't fit the child if used rigidly because time is different - the process may well be the same but its magnitude, timing, background is different. Thus a measure of a

child by adult standard must be considered on the basis of where the child is within the process. Measurements are always valid measurements but the answers may not be valid if the stage of the process is not recognized. Thus we might have a measurement but not an answer!

The foregoing has attempted to say several things:

1. Development of vision is a constant change all through life. Were this not true, visual training, change of findings after change of Rx, comfort of the patient, would not be seen, and analytical optometry could not exist.

2. Developmental vision is the recognition of the processes of vision at all ages.

3. The awareness of the visual development of the small child will give us a better approach to all patients regardless of age.

4. If you see no patient under 40 years, these papers can give you background for a better clinical approach to adult optometry.

5. If you see school age patients and their problems, clinical handling toward better school achievement can come through a greater knowledge of where the child was as a preschooler.

6. If you deal with preschoolers, guidance and assistance can come through the understanding of what should be present at these ages in the process of growth and development.

If you are a reader who reads the last paragraph first, this is what we have written above. These papers on developmental vision, while emphasizing children's care, will assist you to care for your aged patients as well as to start the youngsters to school with what it takes to perform there.

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

)PYRIGHT 1951 ☆ OPTOMETRIC EXTENSION PROGRAM ☆ DUNCAN, OKLAHOMA

DEVELOPMENTAL VISION

February - 1951 Vol.1 No.5

In our last paper of this series on Developmental Vision, we discussed some phases of the visual processes. By illustration and comparison we showed how these processes, like time, and because of time, are ever present regardless of age. These various processes within the act of seeing, and by which the mechanism of sight fulfills its role, are more easily observed in the child, but can also be recognized in the adult if we but look for them. The observation and recognition of this series of motor actions becomes clinically valuable because once recognized, predictive analysis of the visual situation or status at hand can be made. Thus, if we know where the patient - child or adult - has been, where he is likely to go, and where he is now, our clinical judgment will be more effective and purposeful.

The original study of vision, done at the Yale Clinic of Child Development, considered many phases and factors of the visual process. The basic background which emanated from the visual behavior of children gave foundation and impetus to the further study of children within the clinical surrounds of the office as we are now operating.

Since August 1950, we have seen more preschool children than we had anticipated, and our discussion of these children led us into very interesting considerations of child development and particularly visual development. To clarify our thinking in our discussion of a child's visual performance, it has been tremendously helpful to consider the phases of reach, grasp, and release.

Optometry has long emphasized, utilized and even trained hand-eye co-ordination. It has been tested both indirectly and specifically, and it has been trained as a secondary factor when our routine was directed at another goal. Perhaps, too often, its significance has not been fully realized. What does it consist of, and what is its role in total behavior - in performance and/or achievement. Like binocularity, stereopsis and fusion, hand-eye co-ordination often has been elevated to the role of present or not-present, normal or defective, pass or fail. Hand-eye co-ordination is both greater and lesser than the role ascribed to it. It can't be hung on a peg with a label over it and only taken off the hook when needed as is an overcoat. Its processes are present within the act of vision in so many ways that we need more awareness of when, where and how eye-hand relationships become a part of visual performance.

From the early developmental stages, we have chosen two patterns of eye-hand co-ordination which occur at two ages. (1) The child regards the pellet, picks it up, places it in the bottle, maintaining a visual fixation upon every move of the hand. (2) He regards the pellet, visually reaches and localizes it, releases regard and reaches and grasps the pellet with his hand; visually localizes the bottle and inserts the pellet; then visually releases as hand releases. The first stage shows a rather tightly knit eye-hand performance which is most demanding of both eye and hand. The later stage shows the release after grasp - which is still a part of the performance - which allows the child to gain economy and fluidity within his eye-hand act.

Reach-grasp-release is exactly what the nomenclature indicates. It includes flexion and extension, supination and pronation, and center and periphery. These all apply to the individual as a total action system. Vision, as the steering mechanism, especially utilizes reach, grasp and release. Vision, both in its delicately discriminating and forceful role in the individual's spatial orientation, must certainly possess skill, speed, fluidity and finesse in reach-grasp-release.

Since this is true, let us look at the process of reach-grasp-release and how we observe it clinically.

There has been a number of preschool age children (15 months to 4-1/2 years) brought into the office for consultation during the past four months. Problems ranged from excessive blinking or tearing to periodic or constant squint. In all cases, we became so aware of the process of reach-grasp-release that we began to think through the examination and case record on this basis.

For your further clarification, we shall first relate what it is possible to observe in one of these preschool examinations.

The procedure of test situations is the same as formerly used and published in the appendix of VISION with the exception of the Far and Intermediate Estimates which are introduced only when it seems necessary for our further understanding of a patient. A few additional tests are included to help us to further reveal deviations or immaturities of performance. Observations are made of the child's behavior in the reception room and in his adjustment to the spatial situations in the office. These, as well as the parent interview, which is so essential at these ages, will be presented in a later paper.

THE PRESCHOOL EXAMINATION

The Dangled Bell is presented in the standard manner to observe fixation and release, binocularity and monocularity, area of performance, and motility. Beside moving the bell in to the maximum near point, it is also moved in the vertical and horizontal directions. Where there is a marked discrepancy between the performance of the two eyes, some exploration is made of the monocular response.

First, the child's visual approach to the introduction of the bell is noted. Is he slow to fixate, or does he fixate quickly. Is the hand brought into the act almost simultaneously with vision.

Once fixated, does he maintain fixation and how do the eyes perform as he watches the bell move toward him. Are both eyes on it all the time. At what distance does he obtain binocularity and how far does he maintain it. Is his fixation tense or does he maintain it easily. During fixation is the hand brought to the bell spontaneously.

The patterns of release are especially important to observe. Does he release automatically, or is it a positive release. Does he release spontaneously or maintain until the Examiner requests him to look away. (The request is made to "Look at me".) Does he look up at the Examiner without release. Is there a step-by-step process or is it an easy fluid performance. Does blinking assist him in getting out. If there is a deviating eye, does it move to a more central position than previously in the act of release. When there is a spontaneous release, into what area does he look: to right, to left, to near surrounds (within body range), to Examiner, to intermediate or to far.

If the child has not brought his hand to the bell of his own accord, he is asked to touch the bell as it is held at varying distances before him. It is observed whether the hand helps the visual performance, - whether fixation is steadied, thus showing the support of hand in the visual act. It is noted whether he uses the right or left hand and if there is a difference when one or the other is used. Hand may also assist in the release. With some children the hand response is so strong that it may be necessary to inhibit grasp by asking the child to "just look" at the bell.

What adaptive responses are made. Head orientation may be by tilting or turning to the side, bending downward, raising upward. The child may withdraw the head as the bell comes toward him.

Aside from the specific information of the visual performance, we can gather whether he likes to perform within the near area, whether he improves or loses interest and begins to avoid the situation.

The expecteds for the Dangled Bell for non-deviate performance at preschool ages are given in Chapter XII and the appendix of VISION. We shall describe in a later paper, observations of a clinical case seen in the office.

With the information this test situation can give us, we have an excellent basis for the succeeding procedures. We have established rapport with our patient and have a very good introduction to his visual behavior. The observations of this aspect of visual activity provide a starting point for the next test sequence. If reach-grasp on the near Dangled Bell shows the smoother, easier performance, we may better start our retinoscope investigations at near with toys or

pictures, (especially if the child is 30 months or younger). If the release to intermediate or far from the bell is the smoother, then the usual sequence is followed, and the far retinoscopic findings (estimate or measure) are made.

Far Retinoscope: The procedure, as reported, is similar to the No. 4 finding in the Analytical examination. A series of pictures is shown on the far screen, and the child is asked to identify each. It may be difficult to attract his attention there and it is often necessary to present several slides before he begins to identify by verbalization. The Examiner observes the retinal reflex when the child is looking out to the picture on the screen, and also when he is identifying. Changes in brightness, in color and in motion of the reflex of either and/or both eyes are reported. One eye may dull and the other brighten, one may show a with motion, the other an against. One may have a hazy, ill-defined streak regardless of the amount of motion, or it may be a sharply defined streak.

Reaching toward the target may bring a change of color or motion. The child may also cock the head in a characteristic position to maintain regard at the screen.

There is a period of observation of the changes and process before the lens is introduced. Under 30 months of age, it is not always possible to secure a measurement by neutralization with lenses so an approximation is recorded as well as the variety of responses observed. At the very young ages (15-18 months) a toy held before the screen may be substituted as a target.

We are again aware of how well the child can remain in this demand of distance seeing. Some children appear more comfortable 'out there' than they do in the more confined near situation. Others may want to get up and go to the screen, while some will ignore it almost entirely and try to seek something within body range.

Near Retinoscope: This is similar to the No. 5 finding in the Analytical examination. Brightness, color and motion of each eye and both are followed with the retinoscope while the child is regarding the Examiner. Then a card with a simple picture is held about at the child's arm's length and the visual reflex is observed. Reaching with hand again may alter the reflex. Lenses are introduced to neutralize the motion. Recording is made both of the neutralization when the child is regarding the Examiner and when he is regarding the picture.

At the earlier ages, toys may be presented in order to observe the near performance more satisfactorily. Each phase of his manipulation - reaching, grasping, and releasing, may alter the reflex. It is not unusual to find the nondeviating eye dulling down in the process of trying to maintain binocularity.

It should be recalled that throughout the retinoscope situations we are watching the same process as during the dangled bell: Reach, grasp and release; but it is now possible to follow the process by observation of the retinal reflex.

Far Subjective: Now that we have a good approximation or measure of No. 4 and No. 5, and know how the child has responded in these situations, we may have indications that lenses will help him do a better performance in his reach, his grasp, or his release. A rough No. 7 finding may be made on children 36 months and older. A small picture or one with some details is projected on the far screen and his response to plus lenses is noted. He may immediately look to far - it lets him get out there. He may identify more readily than previously, or his voice may be increased in volume or his enunciation clearer.

Two new test situations have been added to our office routine at these ages, namely, Response to Prism and Pupillary Reflex.

Response to Prism is obtained by having the child look at a picture on the far screen. A 12 diopter Base Down prism is placed before first one eye and then the other. The child is asked how many balls (or whatever picture may be projected) he sees. If he does not respond by number, he is asked to point. The Examiner also notes shift of the eye. When he points, the position of the two pictures is recorded. The same procedure is repeated with a 5 diopter prism. At near, his reaction to a 12 and a 5 diopter prism is obtained while he is looking at a picture or while he is manipulating a toy. The direction and degree of shift of each eye, or the hand in pointing, gives information which the child might not be able to verbalize as up, down, top, bottom, right or left.

Pupillary Reflex* is observed binocularly and monocularly by moving a small flashlight toward him, as in the Dangled Bell situation. The difference between the binocular and monocular reaction is noted, and the difference in the response of the right and left eye. Is there marked difference in amount and speed of pupil size change monocularly as compared to binocularly.

This test has been watched with much interest because we feel some new aspects of pupillary reflex as it relates to convergence and accommodation in minimal squinters.

\- - - - - - - - - - -

As the authors of this series, we feel these papers can now begin to express the significance of seeing preschool children as clinical patients. This paper especially starts to provide the methods of what to do, what to see, and of most importance: how to become an observer of process and performance in visual behavior.

*A pen light is used with the light directed upward, rather than directly into the child's eyes. Thus it is a bright fixation spot rather than a beam of light directly into the eyes.

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

DEVELOPMENTAL VISION

March - 1951 Vol.1 No. 6

The previous paper on Developmental Vision presented the test situations for pre-school age examinations with the exception of Book Retinoscope.

This routine was purposefully omitted because it seemed important to review the approach, grasp, and release process before illustrating examination procedures with clinical cases.

Further discussion of Book Retinoscope is needed to complete the test routines for all children, but especially the preschool child. This test is just what the name implies - retinoscopy while the child reads or occupies himself with a picture book (if preschool ages) or Gray Oral Reading Paragraphs (if school ages). The primary difference between this test and any other retinoscope test lies in the demand of the test upon the patient. Here comprehension of print or interpretive observation and identification of pictures momentarily places vision into the true role of perceptual performance. All other retinoscopic targets (except line drawings projected onto the wall screen) are nonsense combinations of letters or numbers. Vision on these is certainly not the same as vision on paragraphs or pictures with meaning for the child. If it were the same in both cases, the retinoscopic result would be the same in every phase of both situations. It is the very differences which make the book retinoscope routine so valuable and informative.

The child is presented with an open book (or the Gray Paragraphs) which he holds at his preferred position for reading or observation. The examiner places his retinoscope just over the book and as nearly in the same plane as the page surface. Now the retinoscope is used as in any other retinoscopic measurement and, when desired, neutralization is accomplished with trial lenses placed before one eye at a time. Continued use and observations have shown that the introduction of the trial lens do not alter the reflex to any significant amount. The quality and motion of reflex seen is of more importance anyway.

If the patient is of school age and reading aloud is possible, he is instructed to read a suitable paragraph from the Gray Oral Reading Paragraphs, and the examiner scopes and observes while this is being done. If the child is of preschool age, then the examiner questions "What do you see?" "What is that picture?" "Where is the doggy?" or "Touch the kitty" or "Point to the choo choo train." Using this sequence of questions it is usually possible to secure a response from the child.

Interestingly, book retinoscope is not difficult to do on young children and the changes in reflex are easily observed. Children seem so basically curious about pictures that their attention is not difficult to hold if the pictures are recognizable to them. Likewise the children in the grades seem to read for comprehension without being told that they will be asked questions about the material. Thus if vision acts as the interpreting mechanism the reflex changes, and the changes are observable and can be neutralized with lenses. The pictures the child is expected to identify at each age level can be checked with developmental norms. The paragraphs of print he is to read should be selected according to his approximate reading level. To further check the retinoscopic reflexes as observed on the paragraphs being read, more than one paragraph is useful - a more difficult one or an easier one may well bring changes in the response which are well to note in the records.

The examiner observes the reflex - each eye at a time - color - motion - brightness - changes in speed of the motion of the reflex, etc. during the child's reading or identifying performance.

Is the reflex slow to go into an against motion i.e., does the child have to identify several pictures before the against motion is seen? Once it is observable does it seem to remain rigidly at about the same amount even when he looks from picture to picture, or does it change in a flexible manner? As the child shifts regard from the pictures to the examiner does the against motion remain the same, change to a lesser amount or shift into with motion? Then when his attention is recalled to the pictures does the reflex change to against quickly and fluidly, or is it slow to shift? Does the reflex change when the child brings hand in to point at a picture? Are there any adaptive head posturings, and if so does the reflex change with the change of head posture?

If there has been any reason to suspect squint, or if squint is obvious, this test gives much information. Does performance on Book and the involved identification of pictures bring the previously deviating eye into the act? Again does hand alter the reflex in the deviating eye etc.? All the above observations as made on the non-squinter can now be utilized to further determine the amount degree, timing, and occurance of actual squint or minimal squint.

The significance of reach, grasp and release, in vision became more apparent to us as we continued to use the Book Retinoscope technique. Reach is seen as the reflex changes from picture to picture or from book page to examiner's face. The against motion so consistently observed in this routine may shift to a very high amount of with motion between each picture or as the child looks at the examiner. On the basis of pure bench optics this would indicate an inadequate reach in an attempt to attain conjugation. On the basis of spatial localization this would indicate an over reach in an attempt to localize. On the basis of pure refraction, this would indicate a poor reach, or momentary loss of focus.

When the next picture is found does the reflex freeze on it and show a rigid neutral of a fixed amount - is the grasp too tight - or does the reflex vary greatly in the amount and wobble - is the grasp too loose? If the amount of the motion is fluid, but quite stable within a .25 or .50 diopter, does the reflex dull off as it is being observed or does it stay bright and alive? Is the reflex such that it would indicate alert easy attention, or does it seem to suffer loss of rapport as the task continues?

The release phase of the process is also observable. Does the motion of the reflex change fluidly and purposefully as the gaze is shifted from picture to picture? Is there slow release as indicated by an overholding of against motion when the child looks up at the examiner, or is there overrelease as seen by the flop into too much with motion and then reduction of with to a lesser amount when face of examiner is fixated?

All these phases of the process are observable in the young preschool child. As an example case to show many of the reach - grasp - release phenomena the three-year-old here reported was chosen for several reasons.

From the records of this office to date we find that new cases do not come in with "squint" during the preschool years later than 3 years of age unless there has been some previous evidence of deviating eye. In other words, when on a first consultation at 3 1/2 years of age at least a periodic deviation had been noted at the age of 3 or younger. There might be one exception to this: the child who is reported to deviate only when "looking hard" or at "fine detail". The referrals at age four have a wide variety of symptoms such as stumbling, watering, soreness or redness, styes, etc.

Another reason for choosing a three-year-old child is the developmental significance of the age. At three, form is beginning to emerge from the products of his drawings, from his clay manipulations and his block building. He has a relatively easy balance in his handling of far and near points. All children do not achieve this balance in the same manner as is evident from the findings reported in VISION. Perhaps it is because they do not all gain this balance in like manner that we can observe so much in the visual performance of the three-year-old. Further, in our approach to the interpretation of the visual patterns at this age, we may well think of the various possible adult pattern that he might eventually possess. If at three we find reach, grasp and release more fluid and "efficient" at far and sluggish, ineffective, and difficult at near it might well be the early suggestion of a B2 adult performance. Time and much further observation and reasearch may tell, but we can be allowed a bit of "supposing"

now.

The case given as follows is somewhat incomplete but is especially interesting in its retinoscopic findings. The examination was made following a progress report exam of his mother. No appointment was made for him because the mother had only noticed an occasional turning of the left eye in the past two months. It had not been so persistent that she had become concerned and only asked us to take a quick look at the child. Here are the findings as obtained?

DANGLED - BELL: Converges as bell is brought in on midline and then shifts head slightly to the left in order to maintain fixation. Release to examiner is slower in left eye, but fair parallelism is finally obtained. ("Reach" is good - "grasp" is difficult and maintained via head shift - "release" rather poor.)

FAR RETINOSCOPE: First shows a lot of with motion while looking at line drawing pictures on the far screen. Both reflexes bright. Then finally settles at about plus 1.00 O.U. ("Reach": over reaches as shown by lot of with motion at first - "grasp" is slow but reflexes are bright and he finally localizes for identification with the settling at about plus 1.00).

NEAR RETINOSCOPE: Motion of reflex is variable. At very first there is more with motion on O.S. than on O.D. Both reflexes pale and brighten. When O.S. turns in there is a lot more with motion. O.D. varies around plus 4.50 and brightens and fades. When O.S. is straight and holding it is about plus 4.50. Then as it deviates, varies from plus 3.00 to plus 6.00.

While at Examiner Face and Features pupils down, much less plus. Then O.D. settles at about plus 4.00 and O.S. at about plus 5.00. ("Reach": over reaching or at least not reaching same space locale with both eyes indicated by more plus on O.S. and high plus on both compared to plus 1.00 of No. 4. "Grasp" not stable because plus varies and reflexes pale and brighten. O.S. especially poor grasp - shifting from plus 3.00 to plus 6.00. "Release" not purposeful and happens without control - slips into more with and fading of reflex. Reach and grasp better on examiners features indicated by pupil size change and less plus.

BOOK RETINOSCOPE: About -1.00 but slow to come in. Is a good clear -1.00 reflex when really identifies. When shifts to another picture or to examiner flops into high plus. ("Reach": slow and difficult - "grasp" difficult but good when identification comes in to support. "Release" too floppy and over releases into high plus.)

FAR ESTIMATE: Both reflexes bright - very slow with motion but both quite equal. If either reflex paler the O.S. is, but is hard to tell. Child tilts head down looking up, as though peering under eyebrows and reflexes become redder and less pale but stay about same brightness. ("Reach" - difficult to analyze, but seems to be over reaching as indicated by slow with motion. "Grasp" difficult to analyze but seems better when head tilts down in a possible effort to reinforce "grasp".)

DANGLED - BELL: (repeated to get hand responses). Bell brought in on midline with good convergence O.U. Child was then directed to touch bell. As soon as he touched the bell, eyes spontaneously release and are immediately straight. Hand helps and especially supports and helps O.S. more than O.D. ("Reach improved by adding hand to the performance. "Grasp" hand seems to take over and grasp is better and more stable. As though hand allows a more satisfactory localization and discreet visual performance now not necessary. "Release" no over-release and yet smoother release, reach and grasp both easier because of hand support and likewise release easier, and not as tight a grasp to flop away from in releasing.)

During the exam he was held on mother's lap, but he did not need to refer to her for responses. He responded readily and co-operatively to the bell situation. By the time book was presented, he was beaming and enjoying himself. He did not verbalize spontaneously, but with the book he talked freely. His verbalizations were of good three year quality as was his adjustment to the examination. At the end of the exam he leaned back against his mother and both hands went into his mouth.

For the time being no prescription was given. The far retinoscope (No. 4) showed about a plus 1.00, but we could not be sure this plus gave him any support. Although near retinoscope indications were as high as plus 4.50 and plus 6.00, obviously this could not be given as a Rx. Hands were of great support to him and with the winter activities of a small boy, hands would be

used more than a little in his block play, coloring and cutting. He was dismissed with a three month appointment for further and more thorough examination at which time his progress, or lack of it, will determine the handling.

It would be very easy to assume improper handling here. Under drops, he could well be wearing as much as a plus 4.50 or 5.00, or more. His book retinoscope tests showed that when good indentification was present the high plus was definitely contraindicated, because he could get into the expected against motion. His skeletal control of eyes was of better quality than his visceral control. It seemed to us that visceral control was more immature than inadequate, and the three months progress report would be most important in determining changes within the visceral areas of visual performance.

Perhaps in a subsequent paper we can report on his three months examination. If something more important detours us from further report on this child we at least have had a case which beautifully illustrates the reach-grasp-release phases of visual performance.

The case presented here in delineating reach, grasp, and release, returns us to papers No.4 and No. 5 in this series. In closing the 4th paper we stated 6 premises r.e.: developmental vision. These can now be restated:

1. Development of vision is constant change all through life but of greater import in the fact that is also the constant change all through each visual act.

2. The recognition and observation of each phase of each process at all ages gives us our cues and clues to the future status of the visual mechanism.

3. The awareness of phases discussed in this paper (No. 6) gives us the background for visual performance and visual achievement.

4. If you deal only with adults, the same processes can be observed in Fixations, Versions, Ductions, Accommodative Rock, Fusion, etc. and every phase of the analytical examination.

5. In the school age group of patients the analysis of reach-grasp-release in the skills and analytical exam provides the all important information over and above the measurements obtained.

6. It is this deeper understanding of the total visual mechanism that will let us approach vision as the steering mechanism for all the behavior so necessary to adequate performance within our culture.

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

PYRIGHT 1951 ☆ OPTOMETRIC EXTENSION PROGRAM ☆ DUNCAN, OKLAHOMA

In March, we illustrated Reach-Grasp-Release and the examination for a preschool child by reporting the case of a three year old boy. We had not intended to use this boy as a case study, but when he returned for re-examination at 3-1/2 years of age, the changes in his visual performance were so significant that we should like to present the findings of this second visit in order that they may be compared with those of the first. If you will review the March paper, you will find that the first examination was made at a time reserved for his mother rather than for him, and so it was made in a limited amount of time. He was to return in three months but was not able to come in until six months later.

Wesley is now 3-1/2 years of age and the findings of his second examination follow:

DANGLED BELL: Both eyes are quite straight as he looks at the Examiner. When he is asked to fixate the bell, O.S. immediately turns in. Pursues with O.D. until at about 4", the O.S. adjusts and fixates also. On second trial, he was asked to touch at about 5" or 6" and hand helped eyes fixate binocularly. Again, O.D. pursues with more facility but when he looks at the Examiner both eyes release and appear straight. Again, he is asked to watch and touch. This time he reaches toward the bell with his head as well as with his hand. When hand touches, he immediately looks at Examiner rather than at the bell. Now, as eyes and hands come on bell at the same time, there is an adjustment of eyes. Now, at 4" hand helps and eyes can be observed to adjust for better fixation.

Pursuits: Vertically pursues quite easily and binocularly, raising head only slightly in following upward. He lowers head in pursuit downward, as though head were following instead of eyes.

Horizontally he occasionally pursues. To the left it is jerky but there is better alignment of eyes toward left.

(Where and when possible a child is asked to wink at the Examiner with each eye. This amounts to a monocular fixation test and many times is quite informative. In this case he closed O.S. on request quite easily. When asked to close O.D., he turned his head way to the left and screwed mouth to the left also.)

Let us consider the reach-grasp-release performances now, just as we did in the original examination report.

DANGLED BELL: REACH-GRASP-RELEASE - Reach: Now is better at some places than at others. Is good on Examiner and is good on bell only when finally obtained. Hands support and reinforce. Vertically eyes reach upward, but in the downward direction there is head reaching. Horizontally, reach is segmented. He head reaches unless chin is held. When he closes one eye, reach is better O.D. than O.S.: closing O.S., the O.D. reaches without head; closing O.D., the O.S. reach is reinforced by head and mouth.

Grasp: O.D. better throughout but he can grasp, by adjustment, with both at 4". At this distance, hand helps him to maintain his visual grasp. Adjustment of eyes to grasp is now observed.

Release: After getting a good grasp, he spontaneously and rapidly releases to Examiner or to his parents across the room, but he cannot refixate a specific target or picture on the screen. Eyes are consistently straighter when releasing to the Examiner.

FAR RETINOSCOPE: He was directed to look at the line drawings on the far point screen and when he first peered out, both eyes were straight, then O.S. turned in. The reflex in O.D. was the brighter and O.S. showed more with motion. O.D. was neutral with a plus 1.25 and O.S. showed about plus 1.75 or plus 2.00 As O.S. was scoped again the plus reduced somewhat and then there was less plus in both eyes. He reaches for the lenses

with his head as the Examiner holds the trial lenses before him. Both now stabilize at about plus 1.50 with O.S. showing a duller reflex but O.S. momentarily straighter behind plus.

FAR RETINOSCOPE: REACH-GRASP-RELEASE

Reach: He over-reaches O.S. at first as shown by higher plus in O.S. than O.D. Improves as plus equalizes and as lenses are put before eyes. Here again he seems to reinforce reach by head reaching toward the trial lenses.

Grasp: There is not good grasp and O.D. is better than O.S. Later the O.S. comes in and though it stays duller in color, it begins to grasp as shown by the equalization at about plus 1.50 in both.

Release: There is no over-release into high plus or dullness of reflex; although O.S. is not as bright as O.D., it does not dull off as markedly as at time of last examination, nor does it show a lot of with motion at any time.

NEAR RETINOSCOPE - At pictures: When Wesley looked at the pictures held before him, reflexes were quite equal in color and speed. When he was questioned about what the kitty in the picture was doing, we found that there was a slight with motion of about +.50. When he shifted his gaze to the Examiner, there was an increase of with motion and both eyes were straighter than when he had been regarding and describing the pictures. As he returned to the pictures to describe them, both eyes were holding better and again some head reaching toward the pictures appeared. More equal brightness was observed and the motion of the reflexes were more and more smooth, with more equal and stable motion in each. Now, as he further investigated the pictures, there was further against motion showing.

At Examiner: Wesley was now asked to look at the Examiner and to look at his nose, glasses, hair, mouth, etc. Trial lenses were used for neutralization. He moved head up slightly reaching toward the lenses and there seemed to be some staring through the lenses. When eyes were the straightest in this stare there was a little more with motion than previously on the Examiner's face and +2.00 trial lenses were not enough plus to neutralize. The child pointed to a feature on the Examiner's face and +2.00 gave a good neutral. Both reflexes were bright and although there was quite rapid shift of the motion from a little less to a little more plus, eyes were quite straight. Finally the O.D. slipped off into a lot of plus and the O.S. moved into less plus.

NEAR RETINOSCOPE: REACH-GRASP-RELEASE

Reach: Both in using the pictures and while Wesley's attention is directed to the Examiner's face, the head reaching was noted and it seemed consistently that eyes were straighter in their reach with the support of head activity. Equal brightness and equal motion were observed as he reached for pictures or to the Examiner, and there was no indication of over-reaching.

Grasp: We find good grasp as indicated by the +.50 on the pictures and both eyes showed equal amounts of motion with both reflexes bright and his performance smoothed out as he continued to watch the pictures.

Release: There was good release throughout the near point tests the majority of the time. He released fixation from pictures to Examiner and momentarily maintained binocularity, but then, would again go into his squint. However, as he continued, the shift of fixation became smoother. At one point when the O.D. went into high plus, there was an over-release, while the O.S. showed less plus and was maintaining its fixation within the area of operation. Since the basic and most obvious problem has been the O.S. squinting and the O.D. maintaining most fixation, this release of O.D. and maintainance of O.S. indicated a desirable release of one in favor of the other.

BOOK RETINOSCOPE: Wesley was now given a book of simple line drawings and activity pictures. With the retinoscope placed over the top of the book, the reflexes were observed. He was fixating with O.S. and the O.D. was turned in. The O.S. neutralized with about -1.00 while the O.D. showed plano or slight plus. As he continued to examine and describe the pictures, the reflexes became more equal and fixations became more binocular. As the reflexes brightened and seemed more binocular, both showed -1.50, but there was variation in this motion and he would sometimes lose contact with the picture. At times O.S. would be turned in and then O.D. would be turned in. When he could get both eyes on the pictures at the same time, again the reflexes became more equal in motion and color. During book retinoscope as well as in all near procedures, he released to the examiner to communicate his observations, and when he

did this, he was quite binocular. It was as though when he obtained the binocularity, he attempted to project it to more distant points in space.

BOOK RETINOSCOPE: REACH-GRASP-RELEASE

Reach: It was difficult at first for Wesley to gain fixation on the pictures. He made his first reach with the O.S. while O.D. was turned in. As he continued to regard, he began to reach for the pictures with both eyes, and although binocularity could not be fully achieved, we could feel both eyes operating in their attempts to reach the task at hand.

Grasp: His first grasp was made with O.S., which was about -1.00. Then he grasped with both, the reflexes equalizing in brightness and in motion at about -1.50. But this grasp was maintained only briefly. Although grasp was not constant, he could bring both eyes into good activity, and the equal -1.50 showed that both were getting a good grasp even though he was not able to maintain it.

Release: Although grasp was hard to maintain here, again he did not shift into an over-release, or turn O.S. in, but he attempted to maintain equivalence as he released to the Examiner.

RESPONSE TO OCCLUSION: Occlusion has been used in the preschool children not only as a cover test to see how much turning there is back of the occluder, but also to see how the child reacts to occlusion of either eye. Wesley was occluded alternately to see if shifting the cover from eye to eye would give us any indication of adaptation or adjustment. We found that when we shifted the cover, he made rapid adjustment of eyes to re-fixate. He did not pull away from the occluder in an attempt to get an eye uncovered, but rather, he made a re-fixation when it was removed as though he were attempting to reorient what binocularity he could maintain.

RESPONSE TO PRISM: A trial case prism - base down - of 5 diopters was placed before O.D. as he was asked to regard a spot of light on the distance screen. He reported or pointed to just one light. When the 12 diopter prism was used before either eye he reported on light but said it was up higher. There was no evidence that he was seeing two nor was there an observable directional shift of the eye but there was a momentary hesitancy on his part and some shifting of eyes was prism was first placed before an eye or when it was taken away. He seemed to be attempting to adjust to the movement of one light as induced by the prism, by minor adjustments of fixation. Whether he very briefly say double and could not report it because it was so fleeting is speculative.

RESPONSE TO RED GLASS: The red glass from the trial case was used in a similar manner. He immediately reported the white spot on the wall chart had turned red, but again we noted the eyes shifting about as though he were confused. When asked to point at the light, he spontaneously pointed with the left hand in front of the left eye in such a manner that it occluded the left eye. This stirred his curiosity and he repeated it several times. The confusion noted in the prism response was again observed.

He enjoyed something in these two experiences which prompted him to call to his mother, "Hey, momma, he dues lots of twicks."

COMMENTS: Throughout these three tests -- alternate occlusion, prism and red glass, we found repeated observable attempts toward binocularity. When the cover was removed, his shift to some object or to the Examiner seemed to indicate a definite reach toward use of both eyes. The confusion noted behind the prism and red glass also indicated that he was trying to reach the situation, but couldn't quite make it. Upon removal of each, he would momentarily visually grasp an object in the room to re-establish orientation.

PUPILLARY REFLEX: Monocularly, either O.D. or O.S. maintained only sporadic fixation on the incoming light, with an equally sporadic change of pupil. It was not until the light reaches about 4 - 5" that the pupil contracted but fixation was not maintained.

Binocularly, there was pursuit of the incoming light with gradually reducing pupillary size and at 4" both contracted more. The hand came up spontaneously to point and to touch the light, and pupil size would further reduce. During this performance, Wesley asked, "Do it some more." Within the limits of the performance the binocular reflex was smoother than the monocular.

TOY MANIPULATION: Throughout this examination we saw some change in visual performance when hands entered the act. We were therefore interested to observe his visual performance while manipulating a toy. He was given the nest of plastic

blocks with which to play. While he was busy fitting them one into the other, pupil sizes were normal and equal. His fixations showed both eyes on the blocks and reflexes showed some slight against motion. As he completed nesting the blocks, the color of the reflex changed, then with motion was observed, and then O.S. turned in. The Examiner then gave him a toy car and asked him the part of it. He named "the fender - the head lights - the cab - the box". He called it "a pick up twuck". Pupils were equal in size, both eyes were fixated on the truck, and the reflexes showed some slight against motion. He suddenly reported that he was too hot and took off his sweater. He had been working hard and purposefully.

RESPONSE TO PLUS LENSES: After a period of free movement around the office, he climbed back into the examination chair and trial lenses were placed before his eyes to see if there were any noticeable changes in his responses. Plus 1.00 were chosen arbitrarily and he was asked to fixate the picture of the small house on the wall chart screen. When the lenses were taken away the O.S. turned in and Wesley spontaneously brought his left hand up to point at the picture and the O.S. immediately straightened again. The same procedure was repeated at near point, using a pair of +1.50 trial lenses. He described a small picture while his eyes were observed. He head reached toward the lenses, and eyes adjusted toward binocularity, and as they were removed he tried to maintain the binocularity.

COMMENTS: Throughout the activities with toys we saw a better reach and grasp while he was busy manipulating with hands. The slip from binocularity to squint was observable enough that it could be noted and recorded: first the change of color, then the increase in with motion, and then the turn of an eye. As the trial lenses were used the performance certainly indicated his attempts to get better reach and grasp and again the actual phases within the process could be observed.

- - - - - - - - - - - - - - -

This concludes the 3-1/2 year old examination. The background history and recommendations have purposely been omitted in order to bring out the visual performance as it can be observed in the examination.

To approach this as a Case Study, may we suggest that the readers lay out the March and April papers and the book, VISION, and analyze these findings with the Visual Complex Chart (p. 165) as a guide and compare the visual performance with the 3 and 3-1/2 year old visual analyses. Then consider how you would help Wesley to achieve a more satisfactory visual performance.

This Case Study is presented as a basis for discussing the significant aspects of visual development and as a means of understanding the visual performance of a preschool child. For this reason, the study will be continued in the May paper.

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

COPYRIGHT 1951 ☆ OPTOMETRIC EXTENSION PROGRAM ☆ DUNCAN, OKLAHOMA

DEVELOPMENTAL VISION

May - 1951 Vol.1 No.8

To continue the study of Wesley as a basis for discussing the significant aspects of visual development and as a means of understanding the visual performance of a preschool child, let us now review the first observation at 3 years and the visual examination at 3 1/2 years.

If you have compared these two examinations, you will have noted that at the age of 3 1/2 years, the processes of the visual performance are more readily observable. At this age the phases of reach-grasp-release are more discrete. This would follow the expected developmental change, but in this boy the phases are more exaggerated because of his inability to gain facility in his visual performance.

You will be aware, too, that he is using many adaptive and well-timed means in his attempt to solve his problem.

For immediate reference, a condensation of Wesley's performance on each examination is presented in columns for ready comparison.

DANGLED BELL

3 Year - Converges and then shifts head to left. Eyes converge equally but maintain with effort and then release suddenly. Hand helps steady eyes both in convergence and in release. There was some pursuit. Shifts head to left to center with O.D.

3 1/2 Year - O.D. only reaches. Hand and head participate in reach. O.D. grasps but by adjustment at 4" both fixate on bell. Maintains grasp when gets it. At 4" when reaches with right hand, eyes adjust and fixate. When using left hand, overshoots and closes left lid. Pursues upward more easily than downward. Releases to an object after has grasped with binocularity. When within ability, centers on bell.

Summary - Dangled Bell

On the 3 year examination he attempted to fixate binocularly, although he shifted head to the side. However, the hand had to come in to really reinforce and to maintain what binocularity he could achieve. Thus hand grasp allowed a completion of visual grasp.

At 3 1/2 years he was reaching with head, hand and eyes to achieve his best binocularity.

At 3 years hand helped eyes release visual grasp but at 3 1/2 years he would visually release to an object or to persons as though trying to project his binocularity to other areas in space.

At 3 years he easily shifted and centered with O.D. At 3 1/2 years there was more binocular centering.

FAR RETINOSCOPE

3 Year - No process of reach observable. Over-reaches equally. Settles equally but is still not grasping "out there." Reinforces by tilting head down so both reflexes brighter but is still not "out there." No indication of loose release.

3 1/2 year - Reach is binocular but then slipped to O.D. Grasp is with O.D. but the O.S. then reduces in plus to an equivalent measure with O.D. O.S. duller. No indication of loose release.

Summary - Far Retinoscope

At 3 years there was marked equality of the reflexes in motion as well as in brightness. The only observable change was brought on by tilting the head downward when both reflexes further brightened.

At 3 1/2 years there is still equality of the reflex in motion and brightness, but there are also shifts into inequality in phases of the binocularity.

Release at 3 and 3 1/2 years is very much the same.

NEAR RETINOSCOPE

3 Year - O.D. first reaches, then O.S. reaches. Reflexes pale and brighten and then O.S. turns. Reaches for an area when given point to localize. Grasp is variable. O.D. settles but O.S. does not. Inequality. Grasp is held more consistently when requested to regard a feature of examiner's face. Over-releases and also under-releases with O.S. Extremely variable.

3 1/2 Year - Hand reaches in attempt to gain binocularity but over-reaches, then reaches target. Grasp is variable. Gets ahold binocularly and holds by pointing with hand. Then releases O.D. in order to let O.S. operate. Releases within a discrete area.

Summary - Near Retinoscope

At 3 years there were inequalities, alternation of motion and of brightness in the near situation and the O.S. over-released into high plus. By directing his attention to the features of the Examiner, the inequivalence was more stable, as shown by the retinoscope findings.

At 3 1/2 years reach, grasp and release were a part of the same sequence in performance. Furthermore, Wesley would now maintain O.S. by letting the O.D. drop out. The over-release into high plus was not observed. and he released to a nearby object or to the Examiner.

BOOK RETINOSCOPE

3 Year - Equally against when identifying pictures. Releases into a lot of with motion.

3 1/2 Year - When first identifies, O.S. into against and then O.D. into more against, then both are equally against. Vary and wobble, losing contact sometimes with O.D. and sometimes with O.S.

Summary - Book Retinoscope

At 3 years both eyes are doing the same thing at the same time. With identification there is increased against motion equal in amount in both eyes. When attention left the book, he showed over-release into considerable with motion.

At 3 1/2 years he made the first fixation with O.S. and O.S. showed the against motion while O.D. was turned in. As identification continued O.D. came in to the performance and there was an increased against motion with this increased binocularity. As he continued to respond to the pictures, there was an instability of the reflex in each eye and he would lose contact with one eye or the other. There was no release into high with motion as he looked away from the book.

General Summary

In our observations of preschool children the various age levels gave us the course of the development of visual performance. As has been reported, the child will use one eye, O.D. or O.S., O.D. and O.S. and finally both eyes within the situation or sequence of the moment. This patterned progression was observed in reflex brightness, speed and direction of the reflex motion as well as in the related tests, other than the retinoscope. On the basis of this developmental progression it is interesting to look at the 3 and 3 1/2 year examinations on Wesley.

These phases or stages showed the role of the interaction between the two eyes in the establishment of "binocularity." It is essential to observe this interaction between eyes on the preschool child if we are to be aware of all aspects of his visual performance. Furthermore, this interaction between eyes shows us inequalities, that indicate his manipulation of visual space.

In utilizing the factor of inequality to guide us in finding Wesley's level of performance, we find that at 3 years on the dangled bell he shifts head to the side while eyes were converging equally. (According to Dr. Harmon's theory of Body Mechanics, there are three levels of performance in the act of centering: (1) eyes (2) head (3) torso. Wesley, then, shows us the use of the secondary component in his attempt to center on the dangled bell.) He gains his inequality by head posture rather than by visual response. Thus, at 3 years we see little or no freedom of interaction between eyes.

At 3 1/2 years, he has made a postural adjustment of eyes toward inequality by turning the O.S. inward. At the same time we see a freedom of interaction in the areas of performance not observable previously.

Through the retinoscope tests these same two

factors of inequality and interaction were observable. At 3 years there is equality of reflex motion at far with inequality of reflex motion at near while Examiner's features are regarded. In book retinoscope there is a rigid equality. At 3 1/2 years we see more discrete inequality and even when the motion measured the same in amount, the brightness showed inequalities. At the 3 year exam the interaction was most observable in the near findings where Examiner's features were the targets. At 3 1/2 years the interaction was more of a give and take between the two eyes - on any test.

The additional tests used on the second examination give us further information in these two factors. The alternate occlusion shows us positive interaction in his repeated shifts toward parallelism even though he utilized the side areas rather than reach outward in space. (Here again inequality was a total shift of centering.)

Prisms and red glass did not give us the total interaction as obtained by diplopia, but some relation of eyes was indicated by his reporting of spatial shifts of the target.

<u>Reach, Grasp, Release, Inequality, Interaction</u>. By using Wesley as a case study, we have called attention to the observable factors in the visual performance of a preschool child. Throughout this series we have emphasized <u>process</u>. Until the research at the Clinic of Child Development, the processes of visual development were almost unknown. It is one thing to find them and delineate them, and it is another thing to describe and apply them to an actual child so that others can use them as guideposts and clues when seeing any preschool youngster. In presenting these discussions the basic factors we have used seem to us to be the components of the process that can be applied to every visual study of a child.

From a clinical viewpoint Reach, Grasp, Release, Inequality and Interaction can be observed in some degree or magnitude in each child we have examined from the age of 18 months to the age of 5 or 6 years. From 6 years on these components can still be observed but usually the routine analytical examination can be given, and the quintet is not quite as available for observation because of the complexity of the routine and the advanced development of the visual mechanism. If we can recognize these five components via an examination routine suited to the young child, then the understanding of the processes involved will make analytical findings more meaningful with older children and adults.

A bit of recapitualation on these components could give us the following performance definitions of the five terms we have used so extensively.

<u>Reach</u> is the observable attempt of the visual mechanism to localize and center upon any test chart or object. This is primarily seen in the brightness of the reflex and the speed and accuracy of fixations.

<u>Grasp</u> is the observable attempt of the visual mechanism to identify and relate the test chart or object. This is seen in the continued brightness, the speed and stability of the motion of the reflex, and the maintenance of fixation.

<u>Release</u> is the observable attempt of the visual mechanism to shift from one object or chart or area of performance into another so this whole cycle can be reoriginated on a second object, chart of area of performance. This is seen in the changes in brightness, speed and motion of the reflex and the shift of fixations as re-localization of vision occurs.

<u>Inequality</u> is the dynamic and positive shift of reach, grasp and release from one eye to the other within a sequence of activity. This is seen in reflexes and fixations and is most observable in the dioptric neutralization of the reflex motions.

<u>Interaction</u> is the dynamic move toward organization and unification of two eyes into a performance of binocularity. This is seen in the actions of one eye projected toward a related and purposeful action in the other. These actions are also seen in the reflexes and fixations but are even more observable in the added tests of pupillary reflexes and prismatically induced diplopia.

DEVELOPMENTAL VISION

June - 1951 Vol.1 No.9

The study of Wesley in the previous papers presented the visual examination of a pre-school child and the Examiner's method of evaluating his performance and the suggestions of the developmental trends of 3 and 3 1/2 years of age. The complete record of Wesley's examination including his verbal identifications, his continual and never relaxing attention and his marked awareness of his own performance was not included. These qualities were evident, however, in his visual performance.

Now we would like to present the case study of a 3 1/2 year old boy who is not a "squinter." Although we can observe all of the components of his visual performance - reach, grasp, release, inequality and inter-action - they are less dynamically exhibited than in Wesley. He is a milder boy in all aspects of his behavior.

Tim was first seen at 2 1/2 years of age when it was reported that for the past two weeks the left eye had hurt, watered and turned in when he looked at a book or was tired. He also rubbed it. The turning was never noted when he awakened from sleeping.

The developmental history was not unusual. He walked early and speech was somewhat slower to appear but came in within the normal range. He was of quite even temperament and had had no temper tantrums. At this time appetite and intake of food was good. Sleep had recently been more restless; he needed and wanted a nap, and he sucked his thumb on going to sleep.

Tim showed a definite preference for his left hand. He was clumsy in walking and there was a tendency to toe in. At this time there was also a tendency to overhold in speech. He was not a very active child and was content to sit in one spot and play with a toy.

The following observations of his visual performance were made at this time.

Examination at 2 1/2 years

Far Retinoscope: Both reflexes bright with O.D. brighter. When identifying the line drawing on the distance screen the O.S. shifted into against and then both would shift into against motion.

Book Retinoscope: Both reflexes bright with equal amounts of against motion. It was not a rigid reflex and although it stayed in against, there was a slow shifting of the motion.

Because of the indicated factors of reach, grasp, inequality and interaction, it was felt he should be seen again in three months. It was recommended that he have toys that would help him to move about in space, such as push toys, cars, and ball play. It was planned to see him in three months but he did not return until one year later when he was 3 1/2 years of age.

Examination at 3 1/2 years

Adjustment: Tim was occupying himself with a book in the reception room. He looked at it fairly briefly and casually and then got up to secure another one. He came readily to the examining room, climbed onto the chair, watched its movement upward with mildly apprehensive facial expression.

Dangled Bell: He promptly regarded the dangled bell, followed it in and maintained regard until the Examiner requested him to "look at me". Convergence was smooth but release was slow and the eyes shifted in a step-by-step method, shifting especially to the right and then to the Examiner. On the second presentation the attention wandered from the bell to the Examiner or to the recorder. The Examiner asked, "Where is it?" and he regarded and pointed at it with the left index finger. On the third trial he followed it and then spontaneously released to the Examiner -

again in the same step-by-step manner.

In horizontal pursuit he followed with eyes alone part way to the right and then the head accompanied. To the left the head was included in the pursuit. When the head was held, there was again an easier pursuit to the right than to the left. In the vertical plane the pursuit downward was more facile than in the upward direction, and when asked, "where is it?" he pointed upward without looking at the bell. He now verbalized, "I want to get down" and stirred himself slightly but did not make the move to get down. The situation was changed.

Comment on Dangled Bell: Tim handled the bell fairly adequately. He at first used the step-by-step method of release of the 3 year old but he could also spontaneously release (3-1/2 years) though by the 3 year old method. There was need to reinforce his attention to the bell. Hand did not assist in fixation or in convergence and it was not brought in to assist release as is often true at 3-1/2 years.

Release then was developmentally somewhat slow, but he had a method by which he was able to get out. By history and observation he was over-holding at the time of the 2-1/2 year examination; now he is shifting considerably as we shall see in other situations.

Far Retinscope: Tim named the objects in a picture: "house, food, bone". Responses were sometimes spontaneous and quite prompt. There was a fairly good +.50 O.U. with both reflexes bright and equally so. He was attentive to the situation, watching the screen as well as the Examiner's movements as he secures lenses, etc.

Comment on Far Retinoscope: Reach, grasp and release were observed as a total process. He promptly identified the pictures as presented, and maintained interest at the far screen. There was no shift in the retinoscope findings during reach and release and the amount of plus measured remained the same during his performance.

When previously seen there was against motion when he was at the far screen. We now see the developmental trend toward the extension of space as indicated by the +.50.

Near Retinoscope: As he regarded various features of the Examiner's face on request, both reflexes were bright and there was a measurable +1.00.

With picture identification the reflexes were about plano to some slight with motion and were equally bright. When he released to look at the Examiner, there was slightly more with motion. When Examiner momentarily stopped to report to the recorder, he said, "I want to get down" but readily accepted more pictures. When questioned on the details of a picture, the reflex reduced slightly, usually to plano.

Comment on Near Retinoscope: On the Examiner's features, the -1.00 was approximately the expected at this age.

On pictures the reflex changed to plano or slight with motion indicating his visual manipulation of this area of performance. Within this task, release was observable as he looked from picture to the Examiner which showed the process of his performance. The process was slow and each phase was seen. There was not the facility at near that there was at far. His comment, "I want to get down" indicated his lack of spontaneous interest in this situation and his desire to get away from the demands of the test situation. However, he could continue to respond when the Examiner kept him at it.

Book Retinoscope: He spontaneously named "boy", but then the Examiner questioned for each succeeding response. When questioned what the snow man had painted, he identified several pictures in sequence. When he was answering questions on what the boy was doing, the reflexes were plano to an occasional slight against. But when questioned further, the reflexes changes to -.75. As he continued and named several pictures there was a -.50 which released after each response into a with motion. After naming several pictures he said, "I want to get down" and he was lowered from the chair with the comment that he could return to see more things.

Comment on Book Retinoscope: He was slow to show any amount of against motion while identifying pictures. While identifying pictures there was a slight against motion. When Examiner continued to question him for interpretation of the pictures, the against motion increased to a -.75 which indicated a satisfactory visual performance. But he did not maintain this amount of against, and shifted to less and when it was thus reduced, he released into with motion

after each identification. His inability to maintain his performance was emphasized by his request to "get down".

In order that he could complete the release from the test situation, he was allowed to get down from the examination chair with the comment that he could return.

Prism Response: Responded promptly "two birds" when the 5 diopter B.D. prism was placed before either eye and he regarded a far target or a near target. He also pointed to each image, one directly above the other. Either eye was observed to shift vertically.

Comment on Prism Response: Interaction of eyes was established at near and at far.

Pupillary Response: He was not happy to accept occlusion and asked to get down. He did respond sufficiently to observe the process of the reflex. There was a good reflex both monocularly and binocularly with the finocular perhaps slightly better. There seemed to be a bit more resistence to occlusion of the right eye than of the left.

Comment on Pupillary Response: Reluctance to accept occlusion re-emphasizes the level of interaction and the degree of binocularity present. This was also observed in the slightly better binocular pupillary reflex action.

Summary: Tim made a positive orientation to the reception room, to the examination room, and to the Examiner and the recorder. During the examination he was aware of the whole situation, watching the Examiner and his movements but he did not approach the surrounding instruments or bring hands in unless it was necessary or requested. His responses were easy and he could readily verbalize when he wanted a change of situation.

The primary factors of reach-grasp-release were more of a totally coordinated process in Tim's distance performance. They were more observable as independent factors within his near performance. Because of his need to utilize each as a separate step to an end result at near, his performance was slow. However, he responded adequately although he could not sustain the performance for a protracted period.

The secondary factors of interaction and inequality were adequate for the present. He did not show the factor of inequality to the extent that it has been observed in most children of this age. We might consider his frequent release as a substitute at this time.

Interview with Mother: At the time of this examination Tim's mother reports that she noted less and less turning following the preceding examination and for the past several months there has been no complaint, no turning, rubbing or watering.

He now sleeps well and goes through the day without a nap. He responded readily to the use of thumb and thumb sucking has dropped out completely. It was found that the right foot was some larger than the left and he has been fitted with proper shoes. Walking has improved, feet are parallel, and he now also runs. Play is more active; speech is easier. He climbs a little but cautiously.

Recommendations: The mother was assured that at present Tim has made adequate progress, but it was suggested that he continue to have periodic examinations. His visual processes are adequate for him at present, but he will bear watching through the primary grades.

With the recommendations to the mother in mind, let us review Tim's performance on the present examination in the light of his future years.

He was handling the far situation easily. At near his performance was adequate but loose and not easily sustained. Even on the identification of picture cards, the Examiner had to keep the situation moving so that he could continue to respond. Under the greater demand of the book, it was even more necessary to hold him with the task by repeated questioning. He was not only asked to identify but to tell about the action of the pictures and to tell what the snow man had painted. As the demand increased, his visual performance became more insecure.

Tim had made real gains since his 2 1/2 year examination. Will he continue to develop and consolidate his visual patterns so that he can meet the demands of the early grades in school?

We see now that the Examiner must help to carry him along in the near tasks, that under continued demand he responds with good identi-

fication but with less visual facility. He is ever ready to be away from this near task. To assure him proper visual care, it will be essential to examine him at six month intervals. He has the school situation ahead of him. It is possible that under the demands of the school tasks that he could make visual sacrifices, perform in a manner which would not utilize his potentials or fail to meet the requirements of the school situation. These preschool examinations will be a base for the better understanding of his visual development during the succeeding years.

To illustrate how the observations and findings of a visual examination are recorded, a complete copy of Tim's last examinations is herewith included.

The Examiner dictates his observations on all test situations and the adjustments and verbalizations of the child are observed and noted by the recorder. These are interspersed in proper sequence whenever possible. Sometimes it is necessary for the Examiner to report a sequence at its conclusion rather than when it is in process.

All verbalizations of the child are in quotation marks. Dashes between them indicate they are separate responses. Comas between indicate that they are separate but follow one another, that is, the child has continued to name without further questioning. The Examiner's questions are not put in quotation marks.

Recorded Notes on Examination

Adjustment: Tim was looking at a book in the reception room. He glanced through it, then went to the table and exchanges it for another. He readily came into the office with his mother at the Doctor's request. He approached the chair slowly, climbed up onto it and then watched its movements with mildly apprehensive facial expression.

Dangled Bells: Regards and follows as it is brought in. Release is slow. Examiner asks him to look at him. Step-by-step release. (2) Attention not as well sustained this time. He spontaneously looks away before it comes in. When near Examiner asks, Where? He localized well pointing with left index. (3) Attention still not as sustained as on first trial. This time after pursuing in he spontaneously releases to the Examiner and eyes swing to right and back. Horizontal: Follows further to right with eyes alone and then head moves. To left, head movement accompanies eyes. He releases regard now to recorder. Vertical: Follows downward but not upward. On second trial when asked to point when it is above, he points without looking upward. "I want to get down" but does not move.

Far Retinoscope: "House - food - spoon" "car" "bike" smiles. Do you ride bike? Nods head. Where ride? "Down in the basement". Fair +.50 bright, equally so. Names "clock". Watches Examiner secure lenses.

Near Retinoscope: At Examiner's features: about +1.00 equally bright. At pictures: "train". Almost plano. Slight with and equally bright. Looks at Examiner and slightly more with. "Station", "shoe", "kitty", Food eating. "White". "I want to get down." (Examiner had stopped briefly to report.) See more pictures? Shakes head yes. When Examiner questions about detail there is some less with.

Book Retinoscope: "Boy" Doing? "playing", What playing? "playing boat", "playing duck" "Snow man" Doing? "running". In hand? "Book and brush", Doing? "painting". Paint? "roof, reindeer, man, house, flower". Examiner reports findings to recorder and he says, "I want to get down". Allowed to get down and told can return and see some other things. Plano - occasionally against during beginning of identification and questioning. When asked about what snow man doing went to -.75. Then as continued it was -.50 but comes out into with after each.

Prism - 5 di. Far: "Two birdies" promptly. Points straight and eye movement also V. Same O. D. or O. S.

Red Glass: Asked to point to red, point to white: Points same place. No two and no eye shift.

Prism - 5 di. Near: "Two balls" promptly. Points straight up and down.

Pupillary Reflex: When Examiner starts to occlude he gets ready to get down.(Previously he has verbalized but has not made the move to get down). By doing quickly reflex is observed. Good reflex. Very dark eyes. Binocular slightly better than monocular. There seemed to be slightly more resistence to occlusion to right eye.

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

'YRIGHT 1951 ☆ OPTOMETRIC EXTENSION PROGRAM ☆ DUNCAN, OKLAHOMA

DEVELOPMENTAL VISION

July - 1951 Vol.1 No.10

Thus far in this series we have considered a complex case (Wesley) in order to illustrate (1) the procedure of a preschool examination, (2) the basic factors in the process of visual development, and (3) the observation of the visual process in each situation.

Two examinations were reported in order to show the developmental trend from 3 to 3 1/2 years. These are significant ages in the development of visual performance. You will note that at 3 1/2 years the child participates more actively in the examination situations and coincidentally the mechanics of his vision are observed with greater definition. He is now doing something about something. At 3 years there is not the continuity or purposefulness that is seen at 3 1/2 years. The examination is loosely structured and the areas of performance show the base upon which the child is operating at that time. By 3 1/2 years it is possible to observe what areas of performance the child is utilizing.

The case history of Wesley was followed by a presentation of Tim, who was examined at 2 1/2 and 3 1/2 years. Tim, with his minimal visual problem, is every bit as important to the understanding of the visual development of the preschool child. Tim did not show the extreme ranges observable in Wesley; at 3 1/2 years he had a relatively fluid performance in all areas despite his slow movements and the looseness of his grasp.

The areas of performance each of these children has defined and utilized are similarly patterned at the 3 1/2 year age level even though they are individually expressed.

These cases should also serve to emphasize the need for periodic examinations. In many cases a three month interval is highly important during these early years as we shall see in the case history to be presented herewith.

The examination for children under 3 years of age is not altered to any great extent but it has become essential to supplement toys as targets and to observe the visual performance during hand manipulation. The toy - a three dimensional object - triggers the visual performance and the hand then participates in the visual response. Also, it has been found more satisfactory to do the near retinoscope situations before the far retinoscope at 2 1/2 years and younger.

Because of the interest in children's vision, parents are becoming more aware of visual performance in the early ages. At one time it was difficult to examine a preschool child's visual performance because of the tendency to relate the findings on the bases of adult measurement. Now that we know some of the factors in the development of vision, it is possible to observe a two year old and gain a good basic case record on him.

We will now present the case study of Robin to illustrate the examination of a two year old child.

Robin - Age 24 months

For the last few weeks Robin has complained of eyes hurting. He has always been sensitive to light, even as early as three to four months. When he first walked at about 10 months his father thought he didn't see well because he stumbled so much. He now rubs eyes, squints lids when outside and wants a big hat on when he goes out to play.

Development: Birth - one month postmature. Walked at 10 months, talked at 13 months. Sleeping - good amount and takes afternoon nap. Rubs eyes or ears when sleepy. Eating - definite preferences in food. Milk intake low but takes in combination with other foods. Appetite variability as expected. No thumb sucking. Only brief mouthing of toys while he was teething.

Play: Rides tricycle. Plays with tractor.

Never liked pull toys and preferred to push a toy lawn mower. Never has liked things close to him. Wants book held out away from him. Not much stumbling now but has had two recent falls, one down steps and one headlong into a table. Has a swing but likes to be moved only a little. Earlier cried when taken for a ride in the car.

Examination - 24 months

Accepts placement in the high chair. Looks about a little warily.

Dangled Bell: At 8-10" looks away to mother. At 8" reaches with left hand to bell. At 4" releases and looks to his left. At 4" turns head left. At 4" backs head away. At 4" requested to touch. Brings open right hand up in back of bell. Now reaches to bell without regard. Then says, "Mommy, I want mommy" reaching out slightly. Mother goes and stands just behind him. When pursuit ceased as the bell moved in his fixation seemed to be around the bell but had no relation with it. When the Examiner bumped the bell on his nose, there was a blank response as though nothing had happened.

Near Retinoscope: At Examiner's features: A lot of with motion (?+1.50). Steadier with in O.S. (?+.50). O.D. dulled down. Now O.D. stays dull. Looks away at toy on desk and says "Oh ma." At pictures: "Pretty" "tar" (car) "doggie" "choo choo train" reflex against, bright. Looks at Examiner and with motion. "Night-night" both against. "Baby" stays in against on picture but as soon as identifies, looks up and goes into with motion. "Boy" starts to stand up in chair. "Airplane", "tedbear" - better against on O.D. Rabbit - no response. (Endings of words apt to be sloughed off.)

Far Retinoscope: "Airplane", "car", about +.50. "Trike" -.50. "Ice cream cone". At first lens interfered but now handling better. "Box" (house).

Nest of Blocks: Against, as tries to insert. Now looking at Examiner and does not release against. (Uses left hand quite a bit. Mother reports that he has always favored left hand though there is no left handedness in family.) When using left hand, O.D. seems to posture in, O.S. is more in line. When using right hand, eyes seem more parallel.

Cover: Avoids cover more when O.D. occluded. O. S. moves out when avoiding. Now while O.D. covered, he moves head around as putting cylinder on tower. Also tilts head down, eyes up when O.D. covered. When using O.D. and left hand to manipulate, coordination is good. Now using right hand with O.S and coordination not good. Has maintained attention on pyramid for long span.

Prism at far: 12 diopters. O.D. and O.S. - Eyes shift. Where is it? Starts to move from chair.

Prism at near: 12 diopters. O.D. and O.S. - Before O.S. no shift. Before O.D. moved block above or below trying to orient.

At the end of the first examination Robin began to show fatigue and he was dismissed because there was no obvious deviation that seemed attackable at the moment. However, in our discussion of Robin following his visit, the question of pupil size or pupillary changes arose. Further discussion led us into a consideration of pupillary size changes in relation to monocular and binocular pursuit. Robin had shown very little pursuit ability with the dangled bell as a target. Because of the pertinence to this child, Robin was recalled two days later to investigate these particular responses.

Pupillary Reflex: A small car was first used as a target. Binocular: Could observe them enlarged when he released to the Examiner. Is accepting things a little closer to him today. Pen light is now used as a target. Binocular: Follows in to 4" and then moves head to right and looks at his mother. Pupil reduces and then immediately relaxes. Monocular: Reflexes are faster and are maintained at near.

Comments on Examination - 24 months

Dangled Bell: Slow to get in to near, and does not maintain easily when it is in near area. Either releases by various methods or simply maintains position without further attempts to pursue. On the whole the response is a mixture of 21 and 24 months.

Near Retinoscope: At the Examiner there is a slow reduction of with motion which steadies at about +.50. The O.S. settles more readily and the O.D. dulls down. Again we see the combination of 21 and 24 months. There is not the wide fluctuation of with to against motion of 21 months but there is the suggestion of this process. As the measurement of +.50(24 months) is obtained, the O.D.

reflex dulls. When pictures are used as targets the reflex motion is against and release into with motion as soon as he has identified.

During manipulation of the nest of blocks there is against motion. Previously, on identification of pictures, he released into with motion, but when blocks are used the against is maintained when he looks up at the Examiner.

Far Retinoscope: Lens interfered at first (21 months) but then he handled easily. Identifications were prompt. There was sometimes a measurement of +.50 and sometimes of -.50. This is comparable to 24 months' findings except that there was an equal amount of motion in both eyes.

Cover: Because it was noted during the binocular performance on the nest of blocks that the left hand seemed to support O.S., his response to occlusion was further investigated. To give variety of toy material he was given the pyramid of blocks and while he was putting a block on the stick, his response to cover was observed. When O.D. was covered he would pull away from the occluder or tilt his head downward.

Prism: Although we have utilized prism as a part of the usual procedures on preschool children, here it was particularly important to observe Robin's response to induced diplopia on a near target. At far the eyes shifted in response, at near only the prism before O.D. induced a response indicating diplopia.

Pupillary Reflexes: The difference between monocular and binocular pupil change was observable with the monocular response significantly better.

Discussion of Examination - 24 months

As was stated previously, there was no obvious deviation. In relating Robin to the expecteds, we felt he showed a mixture of 21 and 24 months' patterns of response.

There were several significant aspects of the examination, however. The near areas of visual space seem to be most difficult for him to handle. In the dangled bell he could not follow it in pursuit fashion and fixation was not easily maintained. He turned head away, pulled head back, looked to the side and finally avoided completely. When requested to touch the bell with his finger at close range it was done without regard.

In near retinoscope, the amount of with motion when he regarded Examiner's features, indicated at first that he was not reaching easily and then when he settled (at about +.50) and as he maintained grasp, O.D. dulled down. Again we see a near area difficulty. On the more restricted targets of picture cards, reach, grasp and release were all more evident. Bright reflex with against motion was observed when he was identifying the picture, and there was release to with motion when he looked at the Examiner. On toys manipulated with his hands, he shows visual reach and grasp but does not release freely as he did from pictures.

Identification was equally clear on targets at near and on the far screen. It took less time for him to adapt to the far area than to the near area.

Recommendations to Parent

Robin's lack of fluidity in the near areas, his slowness to visually adapt to near areas certainly indicated that he needed some help in his orientations. The avoidance of the dangled bell and the sluggishness of the binocular reflexes seemed to correlate with his manifest light problem. It was recommended to the mother that a pen light be used and with this as a monocular target, it be moved with sweeping movements before the non-occluded eye. After several days of monocular pursuits, the light was to be used for binocular pursuit and fixations in push up, rotations and versions. After several more days, he was to be allowed to handle the flash light by himself. She was advised to do this very briefly, to introduce it very opportunistically or as a part of some daily event.

Robin - Age 27 months

Robin returned for re-examination three months later when he was 27 months old. His mother reports that there has been almost no complaining of eyes recently and there is much less avoidance of bright light. His parents have especially noted that he used either hand now and is more facile in the use of his hands. The father has noted that his general play has much improved.

Examination - 27 months

Dangled Bell: Eyes converge as bell is prompt in. O.S. is slow in releasing. Now turns head slightly to help align. O.S. slow to release but gets out. Vertical - When moved upward O.S. is in, O.D. is out. Now gets both eyes in and moves head up. Now stares at Examiner. Cannot be held to pursuit of bell.

Far Retinoscope: Equally bright. A little more with in O.D. Plano O.S. Now O.D. +.50 to +.75 O.S. plano. O.D. pupil slightly larger.

Near Retinoscope: At Examiner's features: O.S. pinker. O.D. dulls off. Lot of with. Staring. Equal at about +2.00 or more. Now about +.75 to +.00 shifting rapidly. Beyond Examiner equally with. Equally with; equally bright.

At pictures: Plano a little against, equally so. Blinks at light. "Dog" (first verbalization). A little against. "Truck" More with.

On blocks: More against motion, quite equal. Release into with when looks to Examiner or Recorder. About -.75. Grasp is good, release is good. Both bright, both equal.

Prism: Far - 12 diopter - Eyes shift at angle. "I saw it", 5 diopter - No shift. Where? Points left hand. Shifts out.

Pupillary Reflex: Binocular - There is gradual change of pupil. Monocular - Pursued better when brought in and accepted occlusion. More change binocularly than monocularly.

Comments on Examination - 27 months

Dangled Bell: Pursuit is slow but the head now supports pursuit and by turning the head slightly alignment of eyes is re-inforced. In vertical plane he tries to pursue with eyes but again when head is raised the eyes are in alignment.

Far Retinoscope: There is now a difference in measurement of the two eyes.

Near Retinoscope: With the Examiner's features as target there is more plus at the start and as the reflex steadies there is more plus than on the previous examination. When he steadies it is +.75 to +1.00 O.U. showing grasp is not rigid. When he steadied at this lower plus the reflexes were equally bright. When pictures are the target he is slow to adapt. Reflex was first plano and the reflexes shifted equally to a little against motion and then into a slight with motion. While he manipulated blocks there was a more rapid adaptation and more against motion (-.75). He could also release easily in with motion when he looked up at the Examiner. Reach, grasp and release are all more observable when toy is used as a target.

Prism: There is still a response to diplopia at far through the 12 id. prism but a 5 di. prism did not elicit a response.

Pupillary Reflex: When previously the pupil change was observable in the monocular performance, now it is more related to the binocular act.

Discussion of Examination - 27 months

Increase in visual performance is evident by further motility of eyes, alignment of eyes maintained by inclusion of head movement, some ability in pursuit, the increase in visceral performance as indicated by the wider ranges and the pupillary changes as related to the monocular-binocular pattern.

The evidence of the changes in visual performance would coincide with the reduction of the complaints of three months ago. It is significant also that there are changes in general play and in his ability to handle both light and movement more satisfactorily.

Recommendation to Parent

To continue with the pursuits, rotations, versions and push-up with the pen light. It was also suggested that the mother introduce some simple movement experiences with his toys such as rolling a car down a cardboard hill. Robin is to return for re-examination in three months.

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

GHT 1951 ☆ OPTOMETRIC EXTENSION PROGRAM ☆ DUNCAN, OKLAHOMA

DEVELOPMENTAL VISION

August - 1951 Vol. 1 No. 11

For nine months the authors have made use of a procedure for examining preschool children which originated as a research study of the development of vision. Even in this relatively short period, it has been found to be of clinical value. Its usefulness can become increasingly important if we can thereby build our clinical information in a standardized way. There is little, if any significant published material on visual performance during these ages other than the research above mentioned, and even in the handling and reporting of deviations such as strabismus, the datum leaves much to be acquired by way of the visual performance or the stage of development in which the deviation occurred.

The three children presented in this series of papers were not selected patients. All are "normal" children who have somehow found it necessary to their survival to utilize the patterns observed in their visual performance. The etiology of the problems does not concern us here although we have recorded as detailed histories as possible on each child. For the present, we are most interested in how the child's visual performance is reflected in his total behavior and how this behavior can be observed during the office visit.

In this office, one morning a week is set aside for the initial visit of a preschool child and so it is possible to allow at least 1-1/2 hour for the child, and the examination can be as extensive as necessary. All subsequent examination are planned with more or less time allowed as the case demands.

Since the preschooler requires undivided attention, preparations are made before the appointment hour. The high chair is available, certain toys acceptable to varying preschool ages are at hand, and the projector with suitable slides, and the Examiner's instruments are in place. The office is made ready for any contingencies.

As a general procedure it is usual to meet the child in the reception room, establish some rapport with him, and casually with the parents, and then to proceed to the examination room. But the Doctor and the assistant take time to observe the child's response to his unfamiliar surrounds. Within the freedom of the reception room, the child may cling to one spot but be visually either at near or at far. He may be all over the place, without maintaining any one orientation point. He may find an immediate need for something to do, to handle and to occupy himself to the exclusion of the surrounds. The reception room gives an opportunity for seeing the total child: visual demeanor, eye-hand performance, total body coordination, verbalization and personal-social relations. Such observations may be made by an assistant who remains a non-participant but the doctor makes the overtures to the patient and his parents.

If the child is slow to respond, it may be more acceptable to precede the examination with the parent interview, thus giving the child a longer time to adjust to the surrounds. But the child is not ignored even during the time taken for interview. He is given some toys with which to play. A few blocks and pegs may be given to him and additional ones offered as he needs them. This allows the Examiner to establish some rapport with the child.

In "Squint" cases it can be very important to give some weight to this initial adjustment. Often those children who are well on the road to giving up binocularity, will make an easier and less discriminating adjustment than those who are attempting to find an avenue of resolution for their problem. So aside from the fact that if we

take time for adjustment, we have greater response to the formal test situations, we find it also true that we are better able to observe the potentialities of performance.

The transition from reception to examining room may be made quite simply if rapport with the child has been established, or this may become an entirely new situation to the child. He may need to hold his mother's hand, to bring a toy with him, but he will usually respond to the Examiner's verbal projection, when it is suggested that "We go and find some toys and see some pictures".

His responses have given the Examiner some indication as to how he can successfully conduct the examination. At the pre-school ages it is particularly important that the tempo is paced according to the child. With one child it may be essential to get responses quickly and to shift to the next situation without delay. Another child may need to be given time in order to respond. He may need to stop and handle an instrument, or to be allowed to get down from the chair briefly.

The parents meantime seem to have been relegated to the back-ground, but they accompany the child to the examination room and remain to observe and to assist whenever needed.

From the records of Wesley, Robin and Tim whose examinations have previously been reported, their reception room or play behavior will serve as illustrations.

Wesley's first visit (at 3 years) was at the time of his mother's appointment and so the usual procedure was not followed. Time was not taken for an adjustment and so it was necessary to have him sit on his mother's lap during the examination. At the second examination (at 3-1/2 years), the parents had prepared him for the visit on the trip to the office. The adjustment and transition were made quite easily by verbalization. He made many references to his parents but could refer also to the Examiner. Following the examination he was observed in his play with blocks while the parents were interviewed. He combined the pegs and blocks constructively and named his building. As he worked with them at a small table, he placed a peg into a hole accurately but with some tension in his performance. Eyes were glued to the task and as he walked away from the structure, eyes were not released. He took a circuitous route around the table, handling feet awkwardly and almost stumbling, and then released his regard. He seemed to be trying to maintain binocularity as he walked away from this near task. He worked at this as intensely as he had on the examination tests. There was some reference to the assistant with him but such comments as he made were in regard to his play. After making about six structures, he finally fatigued and sat down, but for only a moment and then he was ready for a change of scene and occupation He was returned to a room nearby his parents and there he was able to shift from parents and doctor back to the assistant but conversation, interest and attention were as intense as at the beginning of the morning.

In the free play situation, Wesley's behavior was similar to that observed during the visual examination. The intensity of grasp and the difficulty with release could be noted. Yet he showed also that he was making every effort to achieve binocularity. This behavior supported the findings not only of the visual examination but also of the information obtained from the parents through interview. It also assisted in formulating recommendations for the home care of visual performance.

The visual examination is a directed and controlled situation -- even with the flexibility essential to the study of preschool children. The reception room, or free play period, allows for the understanding of the child's spontaneous utilisation of vision with-in performance.

<u>Robin</u> was two years old at the time of his first examination. There was very little inspection of the reception room and he peered starily into space or at a distant place. He accepted removal of his outer clothes, made no special response to the room or to the Examiner. He came readily with him mother to the examination room, looked a little bewildered but was easily lead to the high chair. Although he could be placed in the high chair, his facial expression revealed his uneasiness at being lifted from the floor. After responding to the dangled bell, he verbalized his need for his mother, and cooperated when she stood by him rather than across the room. At the second visit two days later, he sat rather passively on a chair in the reception room, looking starily into space. He

was aware of the approach of the Examiner at a distance but when near him, he turned to his mother and said "want to go", then "my eye hurts", brushing his right eye. When toys were suggested he accompanied the Examiner and his mother willingly. He walked well with good balance. Eye-hand coordination was good as he placed pegs into blocks. He liked to sit at a table rather than to run about the room and showed no interest in watching a car roll down a board. The adjustment had the qualities of both 21 and 24 months, though he was more than usually unresponsive to movement.

Tim, age 3-1/2 years, was immediately noted to have an awkward gait and clumsy body coordination as he entered the reception room. He seemed to "take in" the room, observe various parts of the room but it was not until his mother suggested that he could get a book that he made any attempt to explore. The book was only briefly scanned. Attention was roving though observant and he easily shifted from near to far and back. He attended to the Examiner without responsive verbalization and came readily to the examination room. He made no reference to his mother and cooperated throughout. During the examination it was especially noted how infrequently his hands were brought into action.

These children serve to illustrate the age differences as well as the individual differences of adjustment. The two-year-old could be called naive in comparison to his older contemporaries. There is less pull and tug from his surrounds. He cooperates with being taken about and cooperates in being placed in one locale. However, he likes a familiar person, his mother, within easy range. Robin displayed these characteristics but was more concerned when objects or persons came too close to him. He also was less discriminative of movements at intermediate or far areas than most children of this age.

The three-year-old is more aware of his surrounds - the room, objects, and persons. It takes him time to find his place and to respond, but once his interest is aroused, he begins to enjoy himself. He can slough off response but can start afresh even with the representation of the same material. Fatigue as a rule does not come until he has completed the visit. In the case of Wesley at 3 years, there was an exceptional amount of fatigue at the end of the examination and he was unable to continue further.

Usually the Examiner is more comfortable with a 3-1/2 year old, for at this age the child is more of a participant in the situation. It is now that individual differences are quite marked and the Examiner begins to use the terms of "shy child", "aggressive child", etc. The 3-1/2 year old can direct as well as be directed and therefore it is quite possible for a procedure to get off on the wrong track. It seems to be necessary to recall that the child is more immature than he seems and allowances for this immaturity must still be made. The child has a greater capacity for refusal, for avoiding, and also for recovery. The 3-1/2 year old Tim, who made a smooth and easy adjustment with both independence of persons and of objects, lacked to some degree the challenges of the environment. Wesley on the other hand was so challenged by the office visit that he was responding every moment even if in a chanelized way. At this age it is possible to observe within which area the child seems to perform in a satisfying manner: at near or far, with structural toys or with more fluid media, with people or when alone.

When he reaches four years of age with its expansiveness, there will again be more similarity with his contemporaries.

Gibson, in his recent book, "The Perception of the Visual World" writes on a concept of the correspondence of the visual field and the visual world. It has become increasingly important for Optometry to know how the child is performing in the classroom as well as how the preschool child is performing in his visual world if the child is to receive adequate visual care.

DEVELOPMENTAL VISION

By

G. N. Getman, O.D., and Glenna Bullis

)PYRIGHT 1951 ☆ OPTOMETRIC EXTENSION PROGRAM ☆ DUNCAN, OKLAHOMA

DEVELOPMENTAL VISION

September - 1951 Vol. 1 No. 12

As the title of this series indicates, vision, as we know it clinically, is the result of an ordered, purposeful and sequential development of one area of human behavior. The evidence continues to accumulate to further substantiate the belief that adult vision is the sum total of the early development plus the organisms adaptation to and utilization of the demands of our culture. There must then, be a continuous trend within visual behavior from infancy to senility that is observable by clinical methods. Further, the clinical methods to observe and explore visual behavior should likewise to continuous in purpose, differing in the complexity of the demand upon the patient.

This series has presented methods of eliciting visual behavior in the age levels where full analytical routines could not be applied. This does not mean, however, that the suggested routines are entirely different or unrelated to the analytical just because of the difference in age levels. The continuities mentioned above must be inherent in the techniques or we are acknowledging an unrelatedness in visual behavior because of calendar time. This does not comply with developmental laws nor will it allow our understanding of adult vision as an outgrowth of child vision. This being the final paper in Volume One of this series, it therefore seems appropriate to do a bit of projecting from childhood into adulthood.

A comparison of the preschool test routine with the analytical routine shows these projections. Of course there must be no assumption that the preschool tests elicit behavior or response on the same level of performance as does the analytical sequence, but the area of performance is the same. This is especially evident in the Dangled Bell test. In this test the examiner observes fixation and release, binocularity and monocularity, areas of best performance, and ocular motility, as the child fixates, pursues, and looks away from the test object. The adult tests which demand comparable performance are: rotations, versions, pushup - tests, pursuit and saccadic fixations. To the careful observer, gross fusion and even some indications of duction ability can be seen. If there is lack of convergence on this test one would not expect anything resembling ductions at a later age. If there is over convergence (tending to esotropia) certainly gross fusion is not developing for later use. The same can be assumed for the extreme over release as sometimes seen at early ages. If there is persistent over-release (tending to exotropia) neither can we project into the adult levels any degree of effective fusion.

Projecting still a bit further into adult visual performance we might reconsider the processes of reach, grasp, and release, as we have described them in this series. These basic processes as observed throughout the preschool examination lay the foundations perhaps for blur, break and recovery of the duction tests. (See Vol. 1 No. 5). Here again assumptions must not be made that blur is reach,- break is grasp, and recovery is release. Each of the three-blur, break and recover--must each contain the patterns of reach, grasp and release. The reach pattern in a blur finding (such at No. 9, 16A, or 17A) would be evidenced if any slight amount of prism elicted a judgment of size or distance change. This would be a "good" or "effective" reach. The lack of size or distance changes would indicate inadequate, ineffective, or even absent reach. The grasp pattern would be indicated by the quality of the blur response. A very low blur out might indicate an inadequate grasp and a very high blur out an <u>over</u> grasp, or a hanging on. The release pattern is a bit more subtle but must be present for organismic economy and freedom to perform. The release of clarity (for example: the expecteds of the blur on No. 9: 5 - 9) to allow continuance of singleness via grasp allows this economy and its result, stabi-

lity of the total act.

Throughout the preschool years we see the eye-hand relationships evidenced in this test also. Frequently the child uses hands to steady and support fixation, and sometimes binocular fixation can only be achieved by his bringing hand in to touch the bell. This same demand is noted in adults when a duction recovery seems difficult or impossible until the patient points to or touches the near point chart. Again we see the adults utilizing the same processes to regain or even maintain a visual act that the child used in early attainment of the fixation skill.

Thus, the behavior noted on the dangled bell of fixation and release, binocularity and monocularity, area of performance and motility is the behavior that lays the foundations for all the more complex and discrete performance of the adult.

The second test in the preschool battery is more directly comparable to the standard No. 4 finding. It is entirely possible that we do not fully realize the true value of that very simple instrument--the retinoscope. We have long recognized it as a measuring device but its use as a probe for observing behavior and quality of performance has almost been ignored. It is in the comparison of retinoscopic observations on children and adults that this value of the instrument is most apparent. Of course the use of the retinoscope revolves around a "measurable amount" but the quality and characteristics of that "amount" are equally important, if not more so. The rigid, inflexible, exact No. 4 finding, which any experienced retinoscopist would bet on to the quarter diopter, can frequently be observed in both child and adult. If it is seen consistently in the child over a series of examinations, it is quite safe to assume that this particular sort of visual behavior might well project itself into the later ages. Experience in analytical refraction has shown us that the rigid and exact No. 4 findings do not usually accompany good visual performance at any age. Some of these qualities within the act as observed retinoscopically show the instrument's value regardless of age and thus make the far retinoscope test of the preschool exam and the No. 4 finding of the standard routine almost one and the same probe action.

The third test--near retinoscope---is equally as comparable to the adult test routine, and the same comments can be made as above regarding far retinoscope. There are additional values in near retinoscopy, however, that are well to remember. These values lie in the targets or test charts to be used at any age. Some of our optometric colleges teach their students that since No. 5 is a near test, the target is unimportant just as long as it is "at near." So the new practitioner uses a routine for No. 5 where the patient looks only at the examiner's forehead. Reference to paper No. 5 in this series and to all subsequent papers will show significant differences in the near retinoscope findings when the child attended to toys or pictures, and then to the examiner's face. The fluidity and flexibility of the performance being retinoscopically observed were recorded just as carefully as were the dioptric amounts. If this is so informative in childhood it certainly portends importance in examinations of the adult. Thus, the performance qualities as seen vividly in examination of children can be observed in examination of adults and the findings become more meaningful at all ages. Perhaps we should once again emphasize that the complexity of the targets differ over the age spans but the performance being observed is the result of the same basic processes, and it is these all important performances processes that we are dealing with--<u>not</u> just a simple <u>measurement</u> at a <u>different distance</u>.

Again the reach, grasp, release triad is being observed--age 4 or age 44--but it is now being investigated via the retinal reflex of the retinoscope. Reach is effective and purposeful if the motion of the reflex is stable but not rigid or dioptrically exact--grasp is effective and purposeful if the reflex is bright, sharp and maintained without "flop" or dulling; and release is ample and purposefully effective when there is a shift in dioptrics (with shift in "target values") without loss of brightness or color of the reflex.

Far retinoscope or No. 4--near retinoscope or No. 5--child or adult--the quality of the act is just as significant as the dioptrics and it is the slower, more delineable performances within the child's visual behavior that points up the action and effectiveness of the adult visual system.

The fourth test--far subjective--is also quite directly comparable to No. 7 of the adult sequence. Again the primary difference and in effect the only difference, is

the complexity of the target. The experienced practitioner hears changes in performance on No. 7 as well as measuring them acuity-wise. Identification of the wall chart is the test demand and there are many times wide variations in 20/20 acuity. The line drawings as used for the preschool child can be utilized with the same insight and significance, and if the examiner alertly bends an ear the same changes in performance can be heard at all ages. Now that pure acuity has lost some of its ex cathedra aura we can again utilize and project the more clearly apparent responses of the naive child into the more sophisticated responses of the adult and feel, hear, see, and measure the differences elicited by a change of a quarter or half diopter of lens power. Phorometer, refractor, trial frame, or trial lens, the basic process of identification is the same at any age. It is this process we deal with in infancy or senility--far subjective or No. 7 --and not "kin you see it or kint you see it?"

The fifth test--response to prism hardly needs elaboration. In the adult we call it diplopia. It is of course diplopia also in the child, but it seems more important in the preschool exam. The standard routine uses vertical prism to measure a phoria. The preschool exam uses vertical prism to determine the availability of diplopia. It is very significant here to even determine that the child can see two via dissociation. As he follows instructions and points to "each picture" some phoric indication is gained, but the possibility of inducing disjunction is most important. Certainly there would be no phoria test possible in the standard routine without the early, dynamic and positive value of dissociation of the two eyes.

Many of the highly developed visual performances of the adult would not be possible without this early release of binocularity to biocularity, which can be obtained by use of the vertical prism. The unity of binocularity cannot be fully achieved without the child having some sort of sensory awareness that there are two eyes. The evidence is conclusive that although the pattern for binocularity is innate, the achievement of it is not. The response to prism then is another of the performances which can be followed through the developmental processes to its advanced stages where it is utilized in measuring a phoria. As different amounts of prism are used while the child's attention is on a distant picture, and then on a near picture, we elicit the simplified and stopped down versions of No. 3, No. 13A and No. 13B of the standard routine. The processes involved in meeting the demand of the test device are the same in both cases: i.e. response to dissociation and the resulting variance when lenses (and/or hand in the child) are introduced to alter the quality and degree of the performance.

The sixth test of the preschool battery--pupillary reflexes is more than presence or absense of reaction to light. There have been enough cases seen to indicate that pupillary reaction is much more involved than merely a discrete response to simple change in illumination intensity. First of all the light is not directed into the eyes, but is used as a rather high brightness fixation point with as little direct demand on identification (and accommodation) as possible. These cases seen which provided a clue to what processes are related to pupil change were all rather noteable. They all showed us a rather striking difference between monocular and binocular pupil constrictions. In each case it was either reported or apparent that the child's ability to localize objects about him was not entirely adequate. When this situation prevailed the monocular pupil changes were smoother and more related to the position of the penlight than were the binocular constrictions. The possibility of pupillary reflexes as an indicator of discrete localization through accommodation and convergence was very evident. Could this be the early stages of interweaving in the development of the accommodative-convergence relationships? That by which "nets" can be determined in the case analysis?

This might relate also quite closely to 19, 20 and 21 of the standard routine. In the No. 19 finding especially the difference between monocular and binocular amplitudes is of clinical interest. The size and distance changes that can be reported through the minus and plus lenses of No. 20 and No. 21 also seems related to this early patterning of pupil responses. The first blurs of No. 19 and the blur outs of No. 20 and No. 21 are the measurements in diopters. The relationships of monocular amplitude to binocular amplitude in No. 19 and the patients awareness of lens effects in No. 20 and No. 21 are the processes behind the

diopters. Once more the performance so conveniently visible in the child is the forerunner of the more elaborate discriminations reported by the adult.

The final test of the preschool battery--book retinoscope--cannot be compared to the standard analytical routine because it is a late addition to office procedures. Its value as a clinical probe becomes more evident with time and use, but we need to know much more about the processes involved. Since it does not directly enter this philosophical projection from child to adult it can best be discussed in a later paper.

This has been an interesting volume of papers for the authors. In retrospect we can see the pattern of the volume. We started with a bit of orientation to the area of developmental vision. We then laid out a routine of tests suitable for almost any age, but especially designed for the preschool years. This was followed by exemplary cases which seemed significant for explaining routine as well as the performance elicited. Throughout the series one urge and desire was uppermost in our efforts and was stated in paper No. 5 as follows: "we feel these papers can now begin to express the significance of seeing preschool children as clinical patients............what to do, what to see, and of most importance: how to become an observer of process and performance in visual behavior."

In concluding Volume One, may we reiterate --the process and performance in visual behavior, which is so observable in childhood does not cease at maturity. Visual behavior does not ever transform itself, because of time or senility, into simple, but limiting, numerics of the dioptric system. We need diopters as the mathematics, but we need the recognition of the processes behind the mathematics to gain the insight and skill to cope with, guide, and abet the dominant factor in ageless human behavior----VISION.

VOLUME 30 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getmon, O.D. and N. C. Kephort, Ph.D in which the significonce of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functionol optometric opproach to the visuol problems of child and adult in meeting the demonds of the culture.

October - 1957 Series 2 No. 1

INTRODUCTION

by

A.M. Skeffington, O.D., D.O.S., L.H.D.

Developmental vision is a new term to describe an old interest. The understanding of the development of vision and its significance has been expanded with the progress of optometry as a whole. Optometry has expanded almost beyond the realization of those who are in and of the profession.

You who read these words will understand how fitting it is that this series of articles should be published in this, the official thirtieth year, of the Optometric Extension Program. The Optometric Extension Program was largely founded on the optometric interest in the vision of children. It is also somewhat fitting that on the request of the authors of these papers, Drs. G. N. Getman and N. C. Kephart, an introduction is written by me in the first person as a background for their contribution. It is significant that my first public talk, before any audience, was on the subject of children's vision.

The story is old to some, but appropriate in this setting. It was to fill the commitment of Dr. R. C. Augustine that the invitation came to speak at the Rocky Mountain States Congress of Optometry in Denver in 1922. Augustine was known as the Apostle of Optometry. Having been handicapped all through his years with faulty vision, of which no one knew anything, he chanced to obtain work from an optometrist in Los Angeles. It was discovered that the teen-age boy could not see. Fitted with glasses, Augustine returned to his home state of Illinois, studied, opened his practice in Decatur, and by his dedication in the matter of children's vision, came up through the ranks of the American Optometric Association. Ultimately he was retained by that organization to travel over the country. talking to civic clubs, schools, or wherever he could collect an audience.

Augustine preached the visual care of children. In the Civic Auditorium of Denver the obligation was upon me to talk in the stead of this Apostle who at the moment was hospitalized. The talk was on the vision of children. In it was voiced for one of the early times the idea that the ability of the child to see well did not establish the effectiveness of his vision. Some years later, a talk before the Oklahoma Optometric Convention interested Dr. E. B. Alexander and his fellow stalwarts, and they started to organize Oklahoma for the reception of this new optometric point of view.

Vision and Acuity

There were few consolidated schools, colleges and civic clubs that did not hear this message in those several years. In 1933 a card was distributed to many hundreds of school teachers by the Optometric Extension Program. Its text affirmed that the problem of children's vision was divorced and separate from the notion of acuity and the slavish dependence on the criterion of the Snellen Chart. We were advocating even then that an observant teacher was the best and only really dependable school "screening device" known. The beautiful work of Dr. Marguerite Thoma Eberl at the White House Conferences and other places has substantiated this point of view.

Copyrighted in 1931 were three pamphlets written for use by Dr. Walter Kimball in the Department of Public Information which he then conducted in the A.O.A. These three pamphlets carried the significant titles:

You Do Not See With Your Eyes
It Is A Cruel Test

Man Is Not Going To Hunt Buffalo

The pamphlet, It Is A Cruel Test, referred to the use of the Snellen test target as the final criterion of good or inadequate vision. The general text is illustrated by a few sample paragraphs: "Sometimes the youngster who cannot see that test card is lucky. . .instant sympathy and concern are aroused and something is done for that child at once.

"But pity the one who DOES see well but with eyes ill adapted to the book needs, is condemned as being dull, or lazy -- or simply bad, because he rebels at books and prefers the natural environment of the out-of-doors, away from books.

"Optometry is not interested in merely whether the child sees well - it is interested in whether he sees efficiently.."

Visual Training

Dr. George Crow in Los Angeles, and Dr. Eberl in Milwaukee were doing more and more work with children. The idea of visual training was born. Both Drs. Crow and Eberl, among others, began to develop the concept of visual care for children. The early stages of the concept of preventive use of lenses and training was developed.

In 1941, at the Vision Conference at Ohio State University, a film was shown from the laboratory of the Clinic of Child Development at Yale University. Dr. Frances Ilg was present to describe the significance of some of the developmental sequences. Dr. Mary Jane Skeffington and myself were immediately struck by the possibilities of learning more about this matter of the visual development of children. An invitation was received to view the films at the Clinic. The film was run again, and this time it was stopped at intervals for discussion of certain aspects of the behavior. In that conference room, watching the films, it became evident that there were large areas of the child's development that could only be made understandable if vision was taken into consideration as the dominant process in the genus homo.

Optometry had long been interested in the visual problems of the child. The use of lenses for the school child as a protective aid had developed very early. As an interesting side light, at a clinic in Sioux City, Iowa, long ago, one of the optometrists brought in his son, who was then in grade school, as a patient at the clinic. The examination showed a definite visual problem, and the recommendation was made that this boy be given bifocals. This was done, and Dr. G. N. Getman has worn his bifocals all his school, college and practice years. The program of bifocals on children is of long standing in optometry.

The collaboration with the Clinic of Child Development was continued. It was made possible by a Grant in Aid from the Optometric Extension Program, to have Miss Glenna Bullis be given staff status at the Clinic of Child Development. In these years, Dr. George Crow, Dr. Vivienne Ilg and other were doing examination work on children at the Clinic. Dr. Eberl had taken her work at the University of Chicago in education and was applying it in practice and talking it before Optometric groups at any meeting where she was on the platform. Dr. Crow was developing his idea of Programming of Visual Care through Life, and demanding that children be brought to him younger and younger.

The Baltimore Project

In the middle of the war years, the Baltimore Project was organized. This was financed by the editor of the Ladies Home Journal, to establish a basis for the publication of a series of articles on the care of children's vision in schools, in particular with reference to the prevention of myopia. The Baltimore Project was not set up to prove whether or not it was possible to reinstate acuity in a myope. Optometry had already proven that in practice. The project was designed to make certain definite magnitudes of improvement within a given length of time. The criteria set up for the editor of the magazine were met in every detail. The very great value of the project was unhappily lost in the hue and cry that followed the publication of the data in the ophthalmological journals.

Dr. Emmett A. Betts and others drew attention to the inconsistencies in the published material, and to the fact that the data did not bear out the disparaging conclusions. Even so, the wave of--one might almost call it rejoicing--that swept over the world of men who wanted to believe that there was no way to prevent or to reduce the loss of acuity in myopia drowned out the saneness and the facts of the project. At any event, one great gain was that Dr. Arnold Gesell and Miss Bullis came to Baltimore to see the operation of the project. They were already aware of the need to institute some organized investigation of the visual development in children. There was a need for some one with the insight, the understanding of children and the willingness to arrange time to do a longitudinal study of the visual development. At Baltimore, they became acquainted with Dr. G. N. Getman and their mutual interest in this problem of the child.

Book Retinoscope

Miss Bullis had already developed an extensive interest in visual development. There had been many visits with myself, Dr. Crow and others. Dr. Getman did the thing that few men will do. He arranged to take time from his already busy practice to make extended trips to New Haven, and finally moved his family and lived there for some six weeks at one stretch. He has often related his first experiences. The children were brought up from the nursery school with the teacher from that department. On the quite young, any attempt by the standard refraction methods was defeated by the refusal of the child to allow the use of any apparatus near to them.

Dr. Getman was familiar with the use of the retinoscope in his own practice. He had been a party to the continuing investigation into facets of behavior that were measurable with the retinoscope at Ohio State. He logically used that instrument as his starting point.

The young children would not permit the usual method of retinoscopy. A long cord was put on the retinoscope to permit movement to the full length of the room. Snellen charts were obviously absurd. Availing himself of the experience of the workers at the Clinic of Child Development, Dr. Getman used simple line drawings projected to a screen across the room. The technique worked well. It was a sheer stroke of genius as a means of opening a whole new world of understanding of the visual development of the child.

Like every other user of the retinoscope, Dr. Getman was accustomed to getting a visible movement of the light seen within the eye and to neutralizing that movement with the appropriate lens. It had become quite evident from the work of the June group at Ohio State University that the movement was not a fixed and unalterable thing. Wide changes could be observed in the movement within the eye while the subject retained the same acuity.

From time to time it happened that there was no observable movement in the eye of a child seated on the teacher's lap and watching the targets on the wall with interest. The logical thing to do was to move nearer to the child and make observations at the shorter distance. This was the beginning of the series of observations that have developed into the elaborate interpretive techniques of "book retinoscope." This term was given to the method and the phenomenon because it was in the work on the actual nursery rhyme and school work book that the ultimate significance and potentialities of the procedure became fully realized.

Standardized Performance Tests

The work continued until it became evident that there was need for far more elaborate opportunities for investigation. Dr. Alexander and I assisted with a grant in aid.

At Dr. Getman's insistence, all this time the various developing ideas that came out of the work were being tested each year in the group that gathered every June at Ohio State University. It was a congenial environment. Professor Samuel Renshaw himself had done much work in the problem of child development. His dissertation was on posture. He had published papers on the appropriate abilities of

individuals born blind and blinded. Dr. Getman continued his work, with the opportunities to test out his ideas and with the feeling of security engendered by the approval and assistance of his colleagues.

At all times, the Clinic of Child Development had tested the developmental growth and maturation levels of the children in their studies. These performance tests had been standardized. These now became associated with the visual development.

Early in the study it became apparent that this visual development was not a unified continuum. The two eyes did not give the same response, as could be observed in adults or in older children. It seemed to Dr. Getman that sometimes the responses could be evoked in one eye and then in the other, in the same child. He did not trust himself at first. Gradually the realization came that the variability was not an error in observation but was providing clues to important facets of visual development.

Space World Development

Dr. Getman, Miss Bullis, Dr. Ilg and Dr. Crow, who was in frequent consultation, probably do not know the exact moment when they realized that the child built his space world out from himself. Today the optometrist is well acquainted with the idea. The concept is so familiar to him that it seems as if it had always been. It seems strange that there should ever by any question about it. Yet it was a break with the historical past of incalculable import when it was recognized that the child does build a visual space world, and that the histologically complete eye does not mean an ability to know where and what things are in the space world about the individual.

Starting at the line drawn target on the wall, the observer moved in until eyes "fired," that is, until the reflex brightened. It was observed that this occurred at different distances at different times in the child's life. Observations were made at six-month intervals on the same children. This was woven in with the already significant amount of work on the child's total developmental sequence.

The realization arose that not alone did the child "build his visual space world" out from himself, but it was built first with one circuiting and then with the other. Finally when sufficiently established by use, the two could be used. There emerged a lawful and orderly progression in "accommodation" and "convergence."

Dual Effector System

Here was substantiation for the tenet long taught in the Optometric Extension Program that the visual mechanism was operated by a dual effector system. It was found that at times the child "moved out" in the development of his space world with his "skeletal" or "centering" system. This did not completely coincide with the time when the "visceral" or identification process had been usefully extended to that point. The working staff (usually Crow, Getman, Bullis and Ilg) held conferences with Dr. Gesell. The idea was born and expressed in the beautiful prose of Dr. Gesell, that the skeletal "seeks and holds in space," and that the visceral "defines and discriminates." Then, realizing that none of this could take place without the synthesizing and integrating processes of the organism, it was stated that the "cortical unifies and interprets an image."

"Dangled Bell"

This work, carried to near from far, required suitable targets. The white-headed pin on a stick was tried but found difficult. One day Dr. Gesell was observing and suggested that they use a "cat bell," a silver bell with which careful people "belled their cats." This was held on a black thread and brought in on the midline toward the child. Thus the "dangled bell" was born. With the use of the retinoscope and by observation of the child, the relationship between "grasp and release" of the visual system and the tactual system came to be understood.

It was observed that the retinoscope findings changed with differences in observation on such a simple target as a bell. Dr. Getman introduced the idea of having the child hold, or having held

for him, an actual book. The phenomenon then observed brought about the term "book retinoscope." With the child retaining perfectly good ability to discriminate, the observed retinoscope reflex could and did change from "with" to "against" motion. The color of the reflex could change from brick red to bright silver, to pink, and the pupil could change. These did not always happen at the same time.

It is interesting how this awareness of the significance of color of the reflex has its long-established base in optometry. In the book, "Procedure in Ocular Examination," copyrighted in 1928 by me, the instructions in the chapter on retinoscopy are to observe the color of the reflex rather than the movement. It is stated that when the color shifts from the oriflamme (dull orange) to the argentum (bright silver), that is the true "neutral."

From many sources came the growing realization that visual development might not necessarily parallel the maturation rate or developmental sequence of the bodily processes of the child. So numerous are these sources that even the sequence of their appearance is no longer within the memory of any of us. It is doubtful whether we ever were aware of the order of their appearance. One thing became certain, that the visual processes were a dominant part of the most elaborate development of protoplasm known. The ability of a living creature to synthesize and abstract experience and to ultimately structure the whole through the unifying power of language must be further abstracted through the elaboration of the visual.

Bilateral Body Process

Likewise it became known that this elaboration of potential must be based on the development of a good, sound, bilateral body process as a substructure. The idea that there was need of good, sound bodily development to lend the basic structure for the development of the visual processes caused a complete reorientation of a point of view. It was actually a revolutionary point of view. The magnitude of this change, this reorienting, is evident to any student who is familiar with the thinking regarding human vision before this whole great notion came to be full fledged in optometry.

Somewhere in the midst of this evolution in thinking Dr. Darell Boyd Harmon introduced his data on the 160,000 school children included in the Texas study. Dr. Harmon demonstrated that when the child was forced to distort his total body equilibrium to conserve himself from the stresses of the schoolroom lighting and arrangements, visual deficiencies developed. Harmon called the first deviancies "sub-clinical." He presented the evidence that if not cared for at this stage, they ultimately developed into clinical visual problems. Harmon stated that "twenty percent of children entering school had a visual defect, 2.5 grades later 40% and 2.5 grades later still 80% showed clinical level defects." This whole documented research fitted in so well with the observations and norms for growth, that the idea was almost immediately incorporated into the operations of the forward thinking ones in the profession. The idea of the "Coordinated Classroom" fitted in perfectly with the sequence in development.

Effects of Stress

At Ohio State University one June, a team drew on the background work that Knight and others of Renshaw's graduate students had bequeathed. They wondered what would happen if the biophysical and biochemical changes were recorded while the retinoscope findings were being observed on different levels of reading difficulty. Permission was obtained from police headquarters to use a lie detector. With the team of three and Dr. Getman and myself participating, the first study of the retinoscopic reflex and the body chemistry was made. Another far-reaching development came in the train of the proof that when there were changes in retinoscope findings under different demands, the stress produced changes throughout the organism. The changes observable in blood pressure, respiration, galvanic skin reaction and their accompanying alteration, were too like those cited by Cannon in the "fight or flight" survival reac-

tions of animals to be pure chance. Added validation was given by the investigations at Purdue University under Professor N. C. Kephart of the photographed actual body movement of children under the stresses of the increased difficulty of problem-solving tasks of reading.

Properly, this whole series of papers should be given just to the history of the various streams of ideas that combined into the torrent of today's thinking and operation. However, from all this emerged the now full-fledged program of "preventive optometry." Preventive optometry could be nothing but a byword so long as the visual difficulty was considered gene-endowed. The idea of Developmental Vision, the realization that vision was a development and not a pure maturation, was necessary. The understanding was vital that because acuity was present, the visual process was not necessarily good. This was known in the early thirties, as the copyrighted material cited here shows. It was the work of Dr. G. N. Getman and those who worked with him that brought the evidence and the means of prevention and guidance that is the groundwork of so much of the soundness of optometry today.

The Visualization Processes

The names of those who gave the primary contribution to the concept, Eberl, Crow, Ingram, Daniel and a host of others, thread throughout the tapestry of the development of the total idea. Among those who were early in contributing to this whole picture was Dr. C. Venard Lyons. Early interested in the problem he was one of the first to take up a really significant investigation of vision in the actual schoolroom. He turned to the role of speech and language as great factors in the ultimate visual development of the child. His work was based on an understanding of the tachistoscopic work of Professor Renshaw, the contributions of Professor Ward C. Halstead in his insistence on the oneness of vision and intelligence, and the great insight of Strauss and Lehtinen. Dr. Lyons, aided by Emily Bradley Lyons, became interested in the enhancement of the very highest abilities of the child, the ultimate of the visualization processes.

By all means and in the recognition of everyone who knows, the great contributor in the field of developmental vision has been Dr. Getman. It is literally true that no one can tell the story of developmental vision except Dr. Getman. Much of his work is incorporated in the book, VISION: Its Development in Infant and Child, Arnold Gesell, Paul B. Hoeber, Inc. It is now reputed to be out of print but is completely priceless to any optometrist who aspires to any sort of acquaintance with his profession of today. It literally reopened the field of investigation into the operation of vision in the human, child and adult.

Optometry of 1957

The optometry of today includes play programs from infancy, that the child may grow soundly. It conducts a developmental examination, shrewdly devised and insightfully used, to detect any deficiencies in development and introduce guidance methods. The optometry that has found the reason for and the method of using lenses preventively is almost shockingly new. The optometry that has the statistical evidence that the mental abilities can be increased is the optometry that has been developing since the first theory that departed from the straight bench optics concept. The optometry that developed the concept and accepted the evidence that there was a developmental sequence in vision is the optometry of 1957.

The contributions to that optometry by Dr. Getman rate almost in a magnitude by themselves. He would be the first to protest that statement, for no man is more aware of the contributions that others have made. No man is more persistent in stating his indebtedness to those from whom he learned and those who have worked with him. Yet his contributions so greatly overshadow all other in this field of developmental vision that it is almost his alone, as originator.

It is appropriate that, in this series of papers, Dr. Getman is collaborating with Dr. Kephart. In his work at the Wayne County Training School for the Mentally Retarded, Dr. Kephart encountered many problems having to do with the in-

adequacies of the truly handicapped. Dr. Kephart then went to Purdue University in the Department of Industrial Psychology. Many optometrists heard him in that field. Dr. C. V. Lyons and Emily Bradley Lyons, reading the work of Strauss and Lehtinen, found references to the work of Kirk, who in turn quoted from some original work of Dr. Kephart. They called attention to his contributions in this field.

At his first appearance at a Heart of America Congress, Dr. Kephart talked on the problems of the brain-injured, and talked with optometrists there and at subsequent Congresses. He came to realize more and more that the success with the brain-injured was due to the guidance to bettered performance through vision. He began integrating his knowledge of the brain-injured with the information from the workers in the field of optometry. There mutual interest in children strongly attracted him to Dr. Getman.

From this union of the field of psychology of the brain-injured and the field of optometry in the visually handicapped, has come a new approach to all possible phases of children's difficulties in meeting the demands of the culture.

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

DEVELOPMENTAL VISION

November - 1957 Series 2 No. 2

Seven eventful and gainful years have passed since Volume 1 of these Developmental Vision papers was first published by the Optometric Extension Program. That first volume has now been redistributed to all members and will provide for them a background in developmental vision which can now be greatly elaborated and extended - just as the interest and clinical applications in this field are spreading in Optometry.

It is appropriate that Dr. A.M. Skeffington, Director of Education for the OEP, has introduced this series as he has in Paper No. 1 of this Series. He has been individually and significantly responsible for the solidification of the concepts in Optometry which have given meaning and purpose to our studies of children. His encouragement and interest have given us further incentive to attempt a more comprehensive report of the sequential organization of visual behavior, and its optometric care and guidance.

Dr. Skeffington's account of the events and people who have contributed to our present understanding of vision points up the fact that our current philosophies have come out of clinical research by many optometrists. This a most important fact - because it prevents perpetuation of pet ideas that cannot be communicated to others nor applied by them. We wish to take this opportunity to express our deep appreciation to Dr. Skeffington for his introduction - as well as his many other contributions which are actually beyond enumeration.

Seven years ago in Volume 1, the preschool child was given the most consideration. At that time our interest and knowledge was related to this span of childhood because our study and research had not yet been extended to children in the early school years. There were comparisons made in the visual behavior of the very young child and the adult, and predictions of the visual behaviors we could expect to find in the intermediate age levels. The growth and development of our knowledge and clinical methods have been extensive since 1951 and it is interesting to note that both knowledge and methods have followed much the same patterns of elaboration and integration that take place in a child. As we have gained more information about the visual process, and its integration with the many other performance patternings in childhood, we have been able to elaborate and integrate our clinical procedures for a more adequate understanding of the role of vision in cultural achievement. This is not in the least unusual or strange - because our present understanding of the development of the patterns of performance has come from children themselves. At no time in the past ten years of our studies have any of our concepts originated in an armchair. Further, all of our theories have been in the form of questions which have been put to children in situations demanding an observable performance. Only after this procedure was the question mark on our theories replaced by a period.

Additional cross-checking of our concepts has been done in the libraries where the literature concerning childhood can be found. We have often stated that "there is nothing new in this world" because visual behaviors which we have frequently noted have also been noted by many predecessors in allied disciplines. The amusing aspect of this is the number of times we thought we had made observations and "discoveries" which no one else had ever made. The significant aspect of this concurrence is the validity which comes to our optometric concepts when, without collation or collabcration, the

many students of child development reach identical conclusions regarding vision.

Series 2 of Developmental Vision will bring as much of this related literature to you as the authors can purposefully abstract and apply. It is our intention to search the literature to find the background for design and applications of the tests now so widely used in the optometric investigations of visual development. We are confident you will be pleasantly surprised to find, as we have been, that the tests this series will discuss are all outgrowths of similar tests which have long been utilized and standardized in studies of human behavior. We also feel that you will be surprised - as we already have been - to find that some of our present tests have been used for many years in gaining the right answers for the wrong reasons. For example, several tests of the visual perception of directionality have long been considered tests of manual dexterity - with no consideration of the fact that hands can only perform the tasks demanded by these tests when the visual mechanism provided an adequate input of information. In such instances the tests now become probes of vision and visual development, rather than probes of output alone - if such were even possible.

The great significance of the optometric approach to human performance and behavior lies in our recognition of the role that vision - and the entire machinery for vision - assumes in the development of the human being. This recognition, at our present level of knowledge, has come to us in optometry because we have seen beyond the structure of the organ, to function and the totality of the organism. This has let us see tests as more than a task to be organically performed. We can now look at a test and say "what question is being asked of the organism and what are the processes which the organism has developed to answer the question"? In this fashion tests of "manual dexterity" become useful to us optometrically because of the clues they provide as we observe and study the organismic processes where visual performance is the originating factor in the resulting behavior.

This series of papers has several goals. For a number of years now, we have all talked freely about vision being learned. We have taken our cue from authorities who could understandably make such a statement, because of their years of study and research in the Gestalt of human behaviors. These authorities have frequently attempted to provide us with all the facts upon which their concepts were built, and we in Optometry have liked to savor and repeat such statements as seemed meaningful to us. Some of us have repeated the "punch lines" without enough of the background story. This too is in keeping with developmental philosophy because the learner can usually verbalize before he can fully comprehend. It is not too unrealistic to surmise that some of our difficulty in fully comprehending some of the punch line phrases has stemmed from a lack of adequate background in developmentalism. It is of particular interest to note that much of the current literature dealing with human behavior has distinct - and in some cases strong - developmental flavor. Another reason for our difficulties in gaining broader concepts lies in our "structure" heritage. The dichotomy which exists to some extent in optometric philosophies is an indicator of our roots in structure analysis of an organ. Such roots have made it difficult for us to integrate all the behavioral facts given us. As a result, our concepts are incomplete and, in some regards, inadequate, for a complete understanding of the statement "Vision is learned." One of the goals then in this series is to provide in optometric language and in optometrically related methods, a more complete concept of visual development as related to organismic development and clarification of what is meant by "we learn."

Parenthetically, it is timely to state here that many of our colleagues are now saying "the skills of vision are <u>developed</u> just as the skills of walking and talking are developed" (1), when they converse

1. This will be more completely discussed by Dr. John Streff in a paper by him on definitions, soon to be published by O.E.P.

with patients, or other professions. They are meeting much less resistence and experiencing more freedom of communication with the many people who are also interested in how a child learns.

All of this points up the immediate need for a basic discussion of what we mean by the title of this series. Volume 1 was titled Developmental Vision and as you have already noticed, the title is being used again - not in spite of what we have learned in these past seven years, but because of our expanded understanding. After much discussion of the title by a number of interested persons, we concluded that no other label could be as pertinent to the subject matter which we expect to present. This is primarily true because we realize now - more than ever before - that the basic laws of development apply to <u>all</u> human beings at <u>all</u> ages. Furthermore the laws of development apply to every aspect of vision. It is our hope that through these discussions of visual development some of the confusion which exists in optometric philosophies can be eliminated. It seems to us that we are attacking a problem which also exists in nearly every other discipline dealing with genus homo. R.R. Grinker, M.D., in his recent book (2) discusses the work of Bently (3) and states: "He divides scientific inquiry into three fields, physical, physiological, and behavioral or psychological, in which techniques of appraisal and the language of reports at present are not inter-changeable." Quoting further from Grinker, he completes the discussion of Bentley by saying exactly what we wish to say here: "This goal of interchangeableness is what we are striving to approach today." In this fashion perhaps we too can show that our studies of developmentalism can be applied to the physical (structure of the visual organ, and its appendages) physiological (function of the visual organ and the organismic structures related to its function) and the behavioral or psychological (visual perception and the organismic-environmental Gestalt). Perhaps we too can assist in greater interchangeableness of the techniques of appraisal, and language of reports. The four years of classes in The Development of Vision, The Development of Visual Perception and The Perceptual Development of the Retarded Child have progressed in this direction. Now it is our pleasure to continue this progression through these papers for O.E.P.

The general principles upon which our work in visual development has been based, need discussion now at the beginning of this series. These are the principles established out of the work of many students of child development; the most familiar of whom are Piaget, Gesell, Benet, Frank, Goodenough and Montessori. A multitude of others have also made significant contributions to the present concepts and tenets of developmentalism. In the more pertinent field of visual development, much credit is due Miss Glenna Bullis, the co-author in Volume 1. She, more than any other single person, gave us the links between developmentalism and vision, so we could see the dynamics of growth as they apply to our optometric procedures of clinical study and care.

The general principles indicate the entirety of the modern developmental philosophy. This advancing field of study brings to Optometry an understanding of total function compatible with our concepts of visual function and now provides us with a frame of reference for the sequential processes by which visual performance is engendered.

In duscussing the need for more widespread recognition of developmental concepts Lawrence K. Frank (4) states: "It has always been easier to make intermittent observations and to concentrate upon more tangible products than to study the process itself. This is due in part to our intellectual tradition, which has been concerned with fixed, discrete entities

2. Grinker, R. R., "Toward a Unified Theory of Human Behavior", New York, Basic Books, Inc.

3. Bentley, A. F., "Kennetic Inquiry", Science CXII (1950) pg. 775

4. Frank, L. K., "Individual Development" 1955, Doubleday Papers in Psychology.

and a search for unchanging categories and invariant relations. Time and the changes that occur in time, although studied occasionally in our intellectual history, were largely ignored until the formulation of evolutionary theory. More recently the older three-dimensional space plus one-dimensional time of our classical physics has been superseded by the concept of space-time. This concept may enable us to escape the traditional separation of structure and function. Moreover, psychoanalytic concepts have emphasized the unbroken continuity of the individual's development and the persistence of early patterns into adult life.

"Data, after all, are only data. Even the most meticulous measurements must be ordered to a field, or frame of reference, if they are to have any scientific meaning. This requires some conceptual formulation that is more significant for the science than the actual data which it serves to organize and interpret. Those who are most resistant to discussion of concepts are often naively unaware of how much their thinking and experimental work are dominated by preconceptions which they have accepted without questioning. A scientific investigation may be obsolete before it is started because it is governed by archaic concepts that make the whole investigation, however carefully planned and directed, more or less fruitless. Yet today we have many new and promising leads for thinking research."

A single paper in this Series cannot adequately discuss the entire philosophy of developmentalism. In presenting a summary relative to optometric procedure, the general principles can be discribed by the characteristics of the processes we can now observe in visual development. Movement, contrariety, sequence, reversing cycles, and timing are the characteristics we will discuss here.

A primary characteristic - and perhaps a most important aspect of human behavior - which we can use as a frame of reference in all our studies recognizes the organism as a total action system. The genus homo is designed for action - for <u>movement</u>. This design is such that structure and function are closely related and one must see function as the process of growth and development in order to gain understanding of the structure. This action system should develop as a total unit in a cephalocaudal (head to tail) direction. Head, eyes and mouth take the lead in infantile activities with shoulders, arms, hands, torso, legs and feet following in due order to gain completion of the totality we recognize as the integrated and coordinated unit we call a child. While the major flow of development is in this cephalocudal direction, the action system gains further organismic entity out of the lateral interweaving concurrently taking place. It is significant that while the human being is designed physically and physiologically for movement the ultimate organismic totality only comes about through action. Cephalocaudal development occurs in all living matter, but degrees of individuality and levels of maturity are gained by an infant as a result of his own purposeful actions. Studies in embryological physiology indicate that built-in tensions activate the organism before any sensorial apparatus is developed or in function. The primary source of action of the living unit arises from an internal energy system determined and laid down by the gene matrix of the species. It is this built-in force that sets off the first interactions and exchanges of the organism with its environment and out of these interactions, perceptive systems evolve and function. Grinker (5) states: "Thus constitutionally derived wound-up activity of the organization facilitates its existence before exteroceptive functions have developed. In other words, organizational functions precede system processes." It is the organization of these functional motor patterns which evolves through movement, use, and practice of the entire motor system that lays the foundations for the visual processes of interest to optometrists.

As just indicated above, the sequence of development is not a homogeneous procedure on a straight course with an even front. It changes pace, direction and stability. There are wide swings of organization and integration from age to

5. Grinker, R. R., "Toward A Unified Theory Of Human Behavior," pg. 5

age; narrow swings within a day or even within an examination episode. All of this is significant when we realize that the organism we see as a totality is actually two matched but opposite halves; a right side and a left side. The functional unity of these halves only comes about through reciprocal interweaving of the entire underlying structure. There is a multitude of these "opposites" or contrarities within each structural half of the organism also that must be recognized. The organism develops unity by bringing these contrarities into reciprocal control and we can observe the processes in the visual functions of monocularity vs binocularity; central vision vs peripheral vision; accommodation vs convergence; centering vs identification; skeletal vs visceral, self vs space; etc. Because there is no homogeneity, straight course, or even front anywhere in organismic development, we optometrists must not look for it in visual development. As a result we will see one function in ascendancy at one time, and its paired opposite at another time. This perhaps, is the purpose of a prolonged infancy in the human and allows time for the overall tendency toward progressive integration, and balanced modulation of the many opposing tensions, and contrarities.

The characteristic of sequence in development is of importance to us in optometry. It was the recognition of the sequence in visual development which led us into further study in all areas of child development. This characteristic has taught us that one observation or visual measurement has to be related to all other observations and visual measurements. Likewise in observing or measuring a child, the significance of each finding is to be found in all other dimensions of the child and his performances within his surrounds. Many students of child development are viewing the sequence of development as the process of maturation. They feel that maturation is a process of change and unlearning, in which earlier formed relationships and patterns are superseded by more extended patterns which are more appropriate to the developing individual. In the unlearning the functional capacities which were focused and organized in a previous stage or pattern are released and left free to be reorganized into advanced patterns, as is shown in the transition from creeping to walking and from baby talk to articulated speech. We in optometry see it also in the transitions from monocularity to biocularity to binocularity. The sequentiality of development implies also that unusual delay or omission can alter the end result. We give credence to the concept of organismic totality. Even though there is the over-all unity it is the lack of complete homogeneity that builds ranges and tolerances within the totality. If an extreme delay or omission occurs in any dimension of the organism, the sequence is upset beyond its tolerances and fullest unity does not come about. This we see in amblyopias and anisometropias. It is also seen in the lack of refinement in binocularity when a child misses some of the early motor patterns which are a part of the sequences so essential to what is generally called muscular coordination.

Further we must attend to this sequentiality if we are to program any visual care program. We must also know order of sequence in the total organism. Perhaps we can premise that function is a maturation of structure, and that the psychological processes are a maturation of function. If this is a sound premise, and we believe it to be, we can substantiate our optometric procedures of (1) lens application for consistency of input, both optically and physiologically; (2) visual training to enhance and gain efficiency of function; and (3) the visual perception training routines, as being the visual care sequence in keeping with all other known developmental sequences.

Another factor of development we must recognize is its cyclic aspects. The course of development frequently reverses itself. It is not a process which can be drawn as a straight line across the graph paper coordinates. It is a circular process best illustrated as a spiral like an inverted cone. The spiral starts at the bottom of the illustration as a dot representing the instant of conception and widens, spirally, crossing and reversing itself as it progresses upward. This spiraling is in effect a sequence of reversals. Certain processes of human func-

tion are not reversible. For example as given in Grinker's recent book (5) "--urea is formed as a product of degradation from nitrogen metabolism. Within the organism it is irreversible - is not reconverted into protein." Organic structure is irreversible, but the development of the use and function of a structure can be a circular process which is reversible. In optometric care the structural changes in the eye cannot be reversed, but the circular processes of visual development can be reversed. This is the basis for our present concept of visual training. It is because of this concept that we in Optometry should know which processes of the total organism are reversible to allow more direct and pertinent basic training methods which include the whole organism. The cycles which are expected in the organismic development of the visual function must be known if we are to effectively and efficiently bring about a reversal which will redirect the course of visual development. The fact that this spiral or cyclic aspect exists provides us the cues for our approach to visual problems.

The predilection for structual labels describing an ocular status has plagued us for many years. The prescription of lenses on the basis of the structural label - determined by a single limited subjective test does not take into consideration the principles of development and its timing. The lawfulness of this order and its timing demands that we review our "preconceptions which may have been accepted without questioning."

A chart of growth and development accompanies this paper. We have concluded from careful analysis of this chart that it is a composite of the work of many observers and investigators. It is very useful as a guide but it must not be considered as law. Like any such chart of age levels it is an averaging of performance through time.

Frank (4) offers 2 tentative generalizations which are significant. 1) "We may say that there is a regular, orderly sequence of growth, development and maturation through which all children pass. -- --there is a basic biological process, a recurrent and more or less uniform process in the sense that the sequence of events is very largely fixed or sequentially ordered. It is necessary, however, to add a corollary, namely, that each individual child with his unique heredity and nurture (beginning at conception) will pass through that regular sequence at his own rate of development and will attain structural and functional dimensions which belong peculiarly to him as an individual organism. These differences reveal the magnitude of the progress each child has made as he moves through time and what he has achieved of structural and functional characteristics".

Therefore, we who deal with vision cannot be completely satisfied with structural labels which consider neither sequence nor time. This aspect of visual development still needs the most study and clinical research.

Further, our present concepts of the timing in visual development during the preschool years have not been adequately exposed to the effects of guidance. Expecteds and guideposts (like the chart herewith) are essential but if the developmental processes are as dynamic as we believe them to be, the expecteds in visual development will change as we gain more data and insight. We may find that the expected of basic binocularity at age 5 can be brought about at the age of 3 with proper guidance.

There is a reverse side to this, however. It may be that earlier attainment of some visual performance levels cannot be achieved because of the lack of development in other dimensions of the child. Using the same example of basic binocularity, perhaps we would be exceeding the development in total motor patterns of bilaterality if we attempt to push ocular bilaterality too far ahead of the total organismic sequence.

At this moment, we can only know that the validity of the total unit must not be tampered with or upset. Anyone who has done visual training has unknowingly done this very thing and has probably wondered why his patient did not progress - or perhaps even regressed. The whole answer is not yet available but there are enough answers out of sound,

office procedures and this more recent application of the principles of developmentalism to guide us until more answers come our way.

In summary then, this series 2 of Developmental Vision is now being written to bring to your attention the occurrences and acquisitions since 1951. It is now possible to consider the primary school child with more techniques for observation and methods of guidance than we have ever been able to do in the past. The material provided in Volume 1 is background upon which we can now build a foreground, giving depth and dimension for the visual care provided at all ages. This series will detail the validity of the tests which will be described in the papers to follow. The idea, held by a few, that thousands of cases are necessary for any degree of validity may be altered a bit when evidence of reliability can be produced out of the literature that already exists. We hope this series will be a step toward unification of the philosophies - in optometry, psychology, and education - which concern vision - visual performance, and visual achievement. If such can occur to any degree through our efforts here, all people concerned will come closer to the common goal of greater and more effective assistance to children in visually meeting the demands our culture places upon them. The papers to come will discuss each test now being used by the authors, and many of our colleagues in optometry, in the optometric studies of children. The methods of use at all ages, and our interpretation of the observations made will be given. The background data which can be found in the literature for each test will be given. It is our hope that in reading and studying this series you will get some of the answers to questions in your mind. We hope also that the demands of the task of preparing these papers will give an opportunity to find some answers for ourselves. Paper #3 in this series will discuss the most basic, and perhaps the most informative test - the dangled bell - as our first step toward further answers and a broader understanding of developmental vision.

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE DEVELOPMENT OF OCULAR FIXATION

December - 1957 Series 2 No. 3

Last month this series discussed the general principles upon which our work in visual development has been based. We look upon movement, and the control of movement, as being the primary aspect of human behavior. Many students of human behavior have long contended that the action system of the organism was as important as the sensory system, or perhaps more so. The new field of cybernetics, and the concepts which come from this field, have brought more emphasis and attention to the motor aspects of behavior and performance. Information which is relayed to the organismic control centers through the feedback, or backstroke, mechanisms contains a large motor component. Once movement occurs, the end result in organismic performance may be influenced more by the action itself than by the original sensory information. This concept of performance is of great significance to us in optometry, because we so frequently find the sensory end organ "normal" but find adequate visual achievement lacking. The youngster with 20/20 acuities far and near who has been diagnosed as having "normal eyes," but still fails in so many visual tasks of the early grades, is our prime example.

Optometry has emphasized the importance of ocular movement patterns for many years. Our basic visual training techniques were all designed to establish or regain motor patterns, and the influence of this basic training was shown in the large number of patients who gained visual skill and comfort when only the basic routines were used. The original papers of Dr. George Crow which were provided members of O.E.P. back in the late 1930's dealt with the motor aspect of vision. In the years between then and now, the overemphasis or instrumentation and our expanding knowledge of vision led us away from the importance of basic routines. Just as the development of the organism is cyclic, the development of our knowledge has been cyclic, and we now find ourselves more aware than ever before of the significance and importance of the simple, but most effective, basic routines which can establish the foundational motor patterns in visual performance. Perhaps we can now more fully understnad that pursuit and fixation skills must be established by every child and adult if the more advanced visual space structuring skills are to be gained.

Recently the authors of this series sat at luncheon with a group of educators and optometrists. The discussion, as always, came around to reading abilities. One educator described his work in developing the reading skills of college students. He expressed his suspicion of several speed techniques, but he was not sure why he was suspicious. Another at luncheon described his use of the speed methods and the various instruments in his program. He told of gains among his students - and the losses. Some students even lost the reading abilities they had when he started his program. This educator was blaming the technique and the instrument - rightfully so - but he had the right answers for the wrong reasons. There had been no attention given to presence or absence of the essential ocular motor skills.

Optometrists who have recognized and studied the total visual behavior concepts, as presented by Dr. A. M. Skeffington, through the Optometric Extension Program, have long known that a complete case study has to include an

investigation of pursuits, fixations and rotations. Sometimes these abilities have only been considered as significant in children. We now know that the same tests and the same observations are significant at all ages. A visual problem can be, and usually is, more embedded with time, but the visual processes are the same at all ages. This, again, is a reason for applying the concepts of Developmental Vision throughout all optometric practices.

Since we now have ample evidence that all visual skills are based upon basic motor skills, our primary probe for the investigation of visual achievement abilities is a test of ocular motilities. No matter how "20/20-ish" the ocular receptors are, a consistency of input must be attained first in the visual mechanism for centering. The dangled bell is the most adequate test object for this investigation.

In the years of study and research in the visual development of children, we were constantly aware of three aspects of ocular motility. These we call reach, grasp, and release, and are descriptive terms which can be applied to every aspect of visual behavior. These terms are most easily discussed and observed in relationship to ocular motility.

Reach is the ocular ability which comes out of the gene matrix for motor patterns typical to the genus homo. The ocular mechanism is designed for extensive and highly coordinate movement patterns. Evidence of this is the supply of muscles and nerves leading to each globe and the known movements of the globe even in utero 3 to 4 months before birth. These early movements in the complete darkness of the utero are readying the light receptors for action when light becomes available to them at birth. It seems very significant that the eyes are in movement long before actual light is present, and this is perhaps further evidence of the importance of the visual mechanism. Other motor functions are "practicing" in the final months of gestation, but in no other voluntary performance area is there the advancement in the coordination of pairs and counter-pairs that occurs in the ocular area. Thus, unless there is some deviation due to illness or trauma, prenatally or at time of delivery, the ocular machinery is ready to reach out for light the moment it is available.

Reach, then, is the act of positioning eyes for the most effective reception of light and light contrasts. The brand-new infant responds to light the instant his eyes are open, and by 5-7 weeks of age the infant establishes a fixation skill of considerable definition.

Dr. Bing Chung Ling explored the nature and extent of these earliest fixational capacities. She reports fixation in rudimentary form a few hours after birth, but the first 4 weeks of life do not place much demand upon an infant's visual capacities.

Gesell, in discussing these early ocular behaviors, says, "However, when he is brought to the breast, or when a bottle is offered to him, or when his mother's face or hand comes within close range, he begins to 'catch' sight. That is, he reacts with fixational responses." * These are the first reaches into visual space, and in this respect, eyes lead all other motor systems into the surrounding environment.

An infant was observed by one of your authors at the moment of birth and his first exposure to the bright, bright world outside the uterus. The child was picked up by the nurse and laid over her arm like a waiter's towel. As she walked across the delivery room, she shifted the babe to the other arm as she wrapped him for the trip to the nursery. In so doing, he was suddenly face up under the bright lights of the delivery room. There was an immediate over-all motor explosion - as though every muscle was party to a chain reaction - as though there was a surge of stimuli through every motor nerve circuit. Here was an instant of total

* - Gesell, Ilg, Bullis, Getman, Ilg. VISION: Its Development in Infant and Child, p. 191. New York, Hoeber, 1949

response to nothing more than an impact of light. It was a rather awe-inspiring moment for an observer interested in, and aware of, the significance of the visual system to behavior of the total organism. Here was the instant that set this visual system into action just as surely as the physician's slap on the back-side had set the respiratory system into action. This child was more visually alert than his syblings during the period of infancy. His waking moments were spent investigating and inspecting his nursery surroundings. Daily observations of this child were made during the first 6 months and it was very evident that he used his eyes with more purpose than do most infants. If the concepts of "use makes skill" are valid one cannot help but feel that these early months of rather unusual visual action contributed to this child's visual abilities.

This child has been closely observed for nearly three years and his visual skills have now developed far beyond his meager years. The delivery room episode certainly appears to have been the first step toward reach into visual space, and the observable visual abilities which can be seen daily in this child almost make one wonder if every newborn babe might profit from a similar opportunity to emphatically set the visual system into the pattern of action for which it was intended.

<u>Grasp</u> is the second stage in the process of establishing a consistency of input in the light receptors. Where reach is the mobility of action, grasp is the counterpart and becomes a skill of adaptive immobility. When we think of any action system, we sometimes forget that it must have a stage of <u>no action</u> if it is to be an efficient and productive system. There must be periods of grasp when any system can <u>hold on</u> to the task at hand, and this stage of the process is most observable in the visual system of a child. The intermittent squinter is an excellent example of the lack of grasp. Here the pair of eyes will reach a target but when inspection, or discrimination, is necessary, grasp is lacking and one eye loses its fix on the target.

This stage is of great importance, and the infant must spend much time and energy establishing this grasp ability. To assist his eyes in holding fixation, the infant characteristically rotates head, giving further support to his ocular machinery. He will reach with his eyes, but when his attention, or interest, is drawn to a particular target or contrast, he turns his head to a position which allows eyes to grasp on the midline. Too frequently we see this intermittent performance in the older child, or in the adult, and it frequently indicates a lack of ability in ocular grasp. It is as though the whole head must do the grasping because eyes alone are not capable of the act without assistance.

The infant turns his head in support of visual grasp and, by so doing, takes another step toward the organization of abilities in centering. As soon as the motor patterns for grasp are gained, the child can go on in the development of dexterity in reach and grasp as an integrated ocular motor skill. As these skills are developed, we can observe a relationship between reach and grasp that becomes a process superior to either one of them, and it is interesting to note that the skill in adaptive immobility contributes to the ocular actions we observe in pursuits. Here we can observe a product of the integrations of reach and grasp wherein mobility is enhanced by the very skill of immobility. We might say, the child knows better how to move eyes because he also knows how to hold them still.

This aspect of the process carries over into the third, and equally important, state of the sequence - - - <u>release.</u> The ocular mechanism must also gain the ability to let go - to get off one point of interest and on to another. This factor of release is also evident in many other actions of the child. We have only recognized it as significant in vision in the past 10 or 15 years, although we have dealt with it in all visual training. We gave it more attention in accommodative rock training where we urged our patients to clear a blur as

quickly as possible. This clearing could only occur when the release of the demand on one eye allowed tne other eye to reach and grasp the demand placed on it in the technique being used. We gave it attention in saccadic fixation training, b t at times we gave more attention to the factors of ocular reach and grasp of the next target in the sequence than we did the freedom of release in getting away from the previous fixation point.

The development of skill in release is difficult for the infant. He seems to rrive in this world with less release than almost anything else. He does not develop hand release for many months,and some children do not gain an ability in hand release until late in infancy. The most observable performance in release comes when the child in his high chair spends many hours dropping his toys or spoon and pablum dish - learning to turn loose.

Release in visual activities is of real significance to the child, because only as he can learn to release can he learn to go on to the next point of interest, as mentioned above. Thus we see the cycle of visual action: reach to find; grasp to inspect; release to progress to a re-reach to find something new, re-grasp to inspect and re-release to find another something. On and on goes the sequence of the process we call fixation.

This sequence can be observed in each eye of the infant. Although the gene matrix and the inter-utero ocular actions have set the format for binocularity, it is not developed to its full-blown entirety until the ages of 10 or 12. The advanced states of binocularity must include all of the visceral factors of ocular performance, and these will be discussed in a later paper. The skeletal basis for binocularity should be developed by the child by the ages of 4 to 6, and so we have spoken of these first 5 years as the ages of bi-ocularity - - - the span of time when the child is establishing, and improving, the teaming of the two eyes.

It is very common to observe "off-again, on-again" bi-ocularity of the infant - especially when the babe is attracted to something more than a light contrast at near distances. This fixation is monocular, and the active eye will be held quite well on the ovject of regard. The non-fixating eye may be closed or partly open, resting or wandering. This wandering is often unusual enough to alarm parents, and some "first-time mothers" report that their infant was very "weak-eyed at birth."

At a later stage in the development of bi-ocularity, the non-fixating eye is open most of the waking moment but will actually over-turn and slip clear to the nasal corner in the first attempts at teaming. In the next stage there wil be an alternation of fixing eye, and monocularity shifts rapidly from one eye to the other. Usually by the third or fourth month gross teaming of positioning is gained, and the infant begins to follow and fixate with both eyes at the same time.

Through this period of time there have been four stages of bi-ocularity which can be noted by careful observation:

Stage 1. Random limited movements of eyes with head movements to maintain and support the biologic pattern of a pair. This we have described, in congress and class lectures, as the indeterminate stage. Month-old infants have been observed to move eyes in a cyclo-rotation as they visually reach for bright areas. One infant in this stage of ocular development was observed while being held in a swinging hammock - his right eye making a cyclo movement of 25 or 30 degrees, and his left eye with no movement whatsoever. Because the observer had never before seen such an eye movement, the hammock was stopped and started over a period of 10 or 15 minutes, and this cyclo-rotation was elicited each time the hammock was in movement. It was a bit startling until the observer realized that the muscle attachments and motor systems are present for these rotations just as well as any other movements. The infant, not yet oriented to geometric space,has no reason not to move eyes in this fash-

ion. This cyclo pattern of movement serves no purpose later, h wever, and is hidden in the more observable movements. It is safe to assume, however, that very careful observation would show some degree of this cyclo-rotational ability, or range, in every pair of ultimately skillful eyes.

Stage 2. Alternate monocular eye movements with less head movements and more ocular mobility. This we have described as the right or left stage, wherein the alternate pattern of fixation is most observable.

Frequently the infant will use his right eye when visually reaching to his right, and will use the left eye when attracted to something to his left. During this stage the earliest eye-hand combinations are observable, his right eye will follow his right hand, and left eye will follow left hand.

Stage 3. Overlapping or intermittent bilateral movements of eyes. This we have described as the right and left stage. Now there may be an increase in head movements again wherein the infant seems to use a more directed head shift to assist an eye to get into the teaming act.

Here we can observe a right eye starting to move toward the right field of view. Left eye will lag a bit so the infant moves head with a bit of a toss to the right as if he was boosting left eye toward the right side also. When his left eye also gets on target, both eyes will hold the fixation, and probably move back to midline in complete teaming.

Stage 4. This stage, of course, is the level where bilaterality and bi-ocularity have been completed as the motor patterns for binocularity, and we see the teaming of eyes in every movement. We have described this stage as the right-left stage. Now the child has learned to put the two eyes into action as a unit, and what one does, the other also will do. This stage is the goal of all oculomotor activity, and because it is a species characteristic, called for in the gene matrix, most children accomplish this goal. Once a child does achieve this right-left stage, febril illnesses and minor accidents do not easily affect the skeletal motor system unity of the two eyes. If the child is in one of the previous stages, and unusual illness can, and usually does, leave its mark on the development of fixation abilities. The degree and magnitude of a squint condition seems to be directly related to the time at which the illness struck the child. If the infant was in stage 1, we usually see an extreme convergent squint with extremely limited motility. This is usually accompanied by an amblyopia of considerable magnitude. This will be the child or adult who, in most respects, is a one-eyed individual with no observable ocular defect in the squinting eye, but who has little more than light recognition in the "poor eye." Lens prescription for this individual can include a plano or "any lens" over the poor eye, and, usually, no complaints are heard from the patient.

If the child was in stage 2 when the illness struck, we would see an alternator of some degree. Usually this child or adult will be able to fixate with either eye, but cannot put both eyes on the target at the same time. He may need to touch the target with his hand or finger to get the more frequently squinting eye into position even when the other eye is occluded - or he may alternate almost at will. He may show a lowered acuity in one eye, or either eye can show equally good acuities. This individual is usually quite critical of his prescription. This is the patient for whom some ill-advised practitioners prescribe a plano lens for the low acuity, squinting eye because "it was blind anyway" or "not used for anything," and discomfort is the usual complaint heard by optometrists.

If the child had reached stage 3 before the illness struck him, we see an intermittent squinter. This is the child or adult who holds eyes in a bi-ocular position until stress is encountered, then one eye deviates because ocular teaming was not well enough established to hold up under the stress. In this patient, regardless of age, lens prescriptions must be carefully determined, and, in many cases, the proper lens prescription, especially for near-point, will bring com-

fort and improved motor patterns of binocularity.

If the child reached stage 4 before the upset occurred, the effects do not show as obviously in the skeletal motor patterns of bilateral fixation. This child or adult may not have adequate binocularity, but the problem lies in the later and more advanced stages which are determined as the child organizes and integrates his visceral motor patterns with the more primitive skeletal patterns. This also will be discussed in later papers.

Now, we have been writing in generalities. We must not proceed to the tests of fixation development without several important comments.

We have stated that illness was the cause of squints. It must not be assumed that this is the only cause, but we have been using it as the most common example. As stated and extended in the November paper, the child is, or should be, a total organism. If some deviation in development is induced by any occasion or circumstance which hinders the child in fully exploring and utilizing each stage of ocular activity, the end result can be the same as if there had been a severe illness. The human infant is a most durable piece of machinery, and he usually overcomes the hinderances placed in the path of his development by the lack of social or parental consideration. This being true, the more obvious causes - such as illness with high fever - turn up as the frequent reasons listed on the history of the child. Furthermore, there is more organismic and bio-chemical upset as a result of fevers and the illness which brings the fever.

Very brief mention was made of the use of hands by the child or adult in discussing stage 2 of fixation development. This must be given some consideration now if we are to gain a full appreciation of the importance and significance of eye-hand coordination to the development of fixation.

Gesell, et al,* devote much of their discussion of visual development to the eye-hand behaviors observable in the first five years. In all of Gesell's writings he has put much emphasis on this aspect of the organismic growth processes. "The cycle of eye-hand behavior repeats itself with endless variations throughout the day and throughout a series of days. The variations reflect the ceaseless morphogenesis which is transforming the total action system. A minutely organized structure is being laid down for more subtle and skillful visual performance."

Eye-hand behavior is most obvious and exposed to view in tests of ocular reach, grasp, and release. The patterns of hand reach, grasp, and release are so concurrent with the ocular patterns that each area of behavior can almost be judged by performance in either one of them. Gesell states: "Although his actual visual experiences are concealed, we can infer the developmental transformations from a study of his total action system." Thus much attention must be given the hand action patterns that are related to ocular fixation patterns. This will be discussed in detail as we explore the "what to watch fors" in the dangled bell tests.

Regardless of how repetitive or redundant it may sound, we cannot overemphasize the importance of the motor basis for all visual performance. In last month's paper we stated that the primary characteristic of the genus homo is his design for action and for movement. Any examination of visual performance at any age which does not start with an exploration of the primary motor patterns is an examination of results without attention to the processes which bring about these results.

Last month we quoted the statement of Grinker* that: "organizational functions precede system processes." The standard analytical examination is an investigation of the visual system processes which have been derived by the individual out of his organization of the ocular functions. When one gains a full realization of the sequences of visual development, he will also gain an awareness of the many reasons

*Ibid., pp. 92, 53.

*Grinker, R.R. "Toward a Unified Theory of Human Behavior." New York, Basic Books, Inc. 1957.

why the dangled bell test should be used on every patient in every optometric office.

This is not merely a test for children this is a test of motor foundations for all visual performance.

At this point, we request that you open your bonus booklet of Volume 1 which you received in your October O.E.P. envelope and reread the paragraphs on page 22, written in 1950 about the dangled bell. Seven years later the same concepts hold - with more validity out of seven years of use and observation. We can now elaborate and extend the use of the bell as a test target.

Briefly the routine of use is as follows;

Bring the bell in on the midline, slowly but continuously with the child's attention directed to it (reach). It may be spun or jiggled to attract attention of small or difficult children. Hold the bell approximately 3 inches before the patient's eyes and observe the ease and stability with which the patient can maintain his fixation upon the bell (grasp). When it approaches the patient's nose, he is directed to look quickly at the examiner (release). Repeat to see if repetition improves the performance. Have the patient touch or pinch the bell to see if tactual contact improves ocular reach, grasp or release.

Move the bell slowly and smoothly through the four cardinal directions of ocular movements: horizontally at eye level, vertically on the midline, and diagonally upper right to lower left, and upper left to lower right. The bell should be 8 to 12 inches before the eyes - depending somewhat upon the age of the patient. (Older patients may need it beyond 12 inches so that some degree of "focus" can be maintained.) Request your patient to "keep your eyes on the ball" at all times. Repeat each movement to see if repetition improves the performance and observe the fluidity, or lack of it, in every ocular movement. If movements are jerky, anticipatory or erratic, have the patient follow the bell with his pointing forefinger to see if tactual movement in these cardinal directions improves or supports the ocular performance.

If your patient is having any degree of difficulty in the basic motor control of ocular action, there will be head movements which accompany, or even precede, the eye movements. In this case the patient is always requested to "hold head still - just watch with eyes." If head movements persist, gently cup the patient's chin with your hand to give support or stability to his head.

There are many observations to be made and noted on the record. Next month we shall start discussing the details and implications of these observations. We have a request to make of you. From now until you receive the next O.E.P. envelope, make this test on every patient you see. If possible, we would demand that you do so, because you must learn to see every minute and related ocular movement if the full import of reach, grasp, and release behavior is to be realized. If you will do as we request, all visual performance and behavior that you observe will have more meaning, and will bring to your attention the unique and singular contributions of the optometric approach to vision, its care, and its dominance in all human behavior.

1957
EP Foundation Inc.
(Nonprofit)
Duncan, Okla.

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE ANALYSIS OF OCULAR FIXATION

January - 1958

Series 2 No. 4

If readers of this series have followed our December suggestion and made the dangled bell test on every patient, many varieties of eye movement patterns have been observed. Further, if a comparison has been made with the usual analytical sequence, the relationship between ocular motor skills and visual perceptual skills becomes more apparent. The magnitude of ocular reach, grasp, and release performance, which can be observed during this test, can frequently be correlated with the general motor patterns of the patient. This test illustrates to us, more vividly than any other test we use, that we must recognize a patient as a total organism. This totality will be discussed many times in this series of papers.

Ten years of experience with the dangled bell as a test device has allowed us to delineate the important observations that can be made by the alert examiner. These observations can now be outlined in accordance with the procedure for the test as given in the December paper. The procedures are repeated here so they can be discussed in developmental order:

A. Bell is brought in on the midline slowly but continuously with the patient's attention directed to it. When the bell is approximately three inches before the patient's nose, hold it there a moment, and then direct him to look quickly at you. Repeat to see if repetition improves the performance. Have the patient touch, or pinch, the bell.

Watch for:

1. Teaming of eyes as both reach to locate bell when it is first presented.

This can be the first clue to the degree of bi-ocularity that has been established by the patient. If either eye lags, if fixation is difficult and effort is apparent by the squinting of lids or scowling done by the patient, or if fixation is brief and intermittently on and off the bell, the right and left stage of visual development may not have been completed by the patient. The unstable eye should be observed very carefully throughout the remainder of the test sequence.

2. Teaming and grasp on bell by both eyes when patient continues to watch the bell moving in on the midline.

If the patient scowls or withdraws from the test, note the distance at which the failure in grasp appears. Start again to find out whether repetition lets the patient do better or whether grasp breaks earlier the second time. Bring the bell in to this noted point of difficulty and ask him to touch the bell. Observe the results of hand reinforcement to find whether tactual contact assists ocular location and grasp of the bell. This is the point at which some patients will hold the bell with fingers and not hold with eyes. This patient will frequently release eyes to examiner, to objects, or to other people in the examining room almost as an over-release, as if there was an urge to get eyes out of the task entirely. This would seem to indicate that the eye-hand sequence of visual development had not been completed and the patient is reverting to the hand stages without visual participation.

This behavior must be very carefully observed to be sure that the release of eyes from the target is the result of inadequate ocular mobility and not the higher grade act of localizing so well that eyes are released to get on to the next task. This can be differentiated by observing the ocular release carefully and by repetition with further instructions to keep

eyes on the bell.

If the patient cannot keep eyes on the bell, even with constant reminding, he is probably not capable of maintaining ocular grasp when the bell approaches him. If such is the case, very poor binocular pursuits can be elicited in this near area and the bell will have to be moved away for observations of pursuit ability. Actually this is an important point in the test sequence and, undoubtedly, all pursuit movements will be very inadequate at any distance. Here, also, it is important to watch the eye which appeared to be unstable on the original presentation of the bell.

What the hand contributes to the ocular grasp on this part of the test can be very significant. If the hand supports or reinforces ocular grasp, both eyes will show an easier performance and the scowling, squinting behavior will immediately disappear or diminish. Both eyes will show more stability, but the unstable eye may now snap into a teaming position.

It is frequently informative to ask the patient to use his dominant hand for the bell touch--and then to use the other hand. The unstable eye may come into position to some degree with the use of the opposite hand, and more observably reach and grasp the target when the "same side hand" is used for contact.

If hand contact is a very obvious reinforcement to reach and grasp, we may assume that the eye-hand sequence is not complete, that the rightleft stage of ocular teaming has not been reached, and basic training is indicated immediately. Further, this training must be done outside of instruments with hands in on every part of every routine used. The use of enclosing instruments which represent space, but do not actually duplicate space and distance, will probably hinder the patient's acquisition of ocular motility and the desired visual spatial appreciations. Here it is possible to teach the patient the tricks of an instrument, but he will not project these tricks into his visual space performance, and changes in comfort, and measurable performances (analytical findings) will not occur.

It seems most important at this point in this paper, to pause long enough to reiterate the significance of the sequence of visual development, and the motor abilities which determine the adequacy of visual behavior. One needs to go no further in the examination than these first two tests to judge what degree of visual ability a patient will demonstrate in every test to follow. If this test gives evidence of incomplete teaming of eyes, and a dependency on hands for reinforcement of ocular reach, grasp, and release, none of the higher grade visual abilities will be present. This means that every test of visual performance will show the effects of these basic inadequacies, and the patient's visual space judgments will be incomplete, and, in some cases, entirely lacking.

It is the opinion of your authors that a lens prescription cannot completely serve its purpose if the patient shows such a lack of visual space discrimination. He should be trained through lenses, of course, but plus for constant wear will be more effectively assimilated when the patient has the opportunity to gain a perception of "out in space" in the total visual performance mechanism before the lens is applied.

As this perceptive discrimination is developed by the patient through the completion of fullest possible binocularity and the resulting levels of visual independence, the prescription will then provide the patient with the phenomenon of "as if the object of regard were moved out in space."

At this moment some are asking, "What about the plus 5.00 cases"? This is where individual professional judgments determine the course of action. In some cases, part or all of the plus is essential to gain some consistency of input. On the other hand, there must be a consistency of reach and centering before there can be consistency of grasp in the accommodative function, and in many cases the plus 5.00 reduces amazingly when the primary motor performance improves. Further clues out of tests which will be discussed as this series of papers continues

will assist your decisions in such instances.

3. Release of ocular grasp from bell, and reach to examiner when patient is instructed, "Now look at me, please."

The speed and fluidity with which both eyes let go of the bell is a pertinent indication of the patient's awareness of where the bell and examiner are in space. It is also an indication of his readiness to perform in the ever-changing task of continuous visual contact with his world. It is as important to watch the teaming of eyes when they release from a target as it is to observe this teaming when they reach for one. A lack of skill in release can interrupt the continuity or consistency of input just as critically as either the lack of reach or grasp. The readiness of any system to operate as a stimulus receptor implies a freedom to set itself free from a previous task in anticipation of another task. Thus, any degree of overholding becomes "noise on the line" and an interruption of receptor performance.

Here it is again of interest to the examiner to note whether there is overholding on a near target by both eyes for either eye. Again, the unstable eye can be a deterring factor, and i the patient needs tactual contact on the bell to assist his ocular relea e, it is further evidence of the lack of adequate bilateral motor control so essential to binocularity.

Children of preschool age characteristically show some degree of overholding - if a program of developmental visual guidance has not been in force. These youngsters usually need hand on bell to release eyes from it, and even though reach and grasp have seemed quite adequate, one or both eyes may release in a stepwise or slidewise manner. If such is the case, the parents should be promptly instructed to give their child near-to-far fixation experiences.

The adult who overholds on the bell may show a similar overholding on standard duction findings which conceivably could alter the case syndrome. The esulting prescription would have to be written with consideration of the performance on bell as well as the analytical syndrome. It seems possible also that high breaks on #10 and #16, which would tend to increase the B_2-ness of a case, might influence the decision to crowd plus at near to the dissatisfaction of a patient.

The reach, grasp, release triad that we wrote about in last month's paper becomes more significant as we relate these processes to further test procedures. These three parts of a simple test routine give us a realization of the complexity of the performance involved in the mere task of "looking at something." It begins to appear that it is not as mere a task as we have thought it to be, and we need to make careful notes of every observation we can make.

We have given much lip service to pursuits and saccadic fixations without enough attention to the processes out of which the control of movement evolves. We would also like to remind you of the start-stop-start control so necessary to ocular pursuits, which is implied in all the preceding paragraphs. We wish to discuss the dangled bell techniques for the investigations of pursuit abilities but not until we have emphasized that the adequacy of ocular pursuit demands an elaboration of control in reach, grasp and release and cannot be analyzed without an underlying awareness of these processes and their contribution to the total act.

An ocular pursuit of a moving target requires a very fine balance between the mobility of action in reach, the adaptive immobility of grasp and the start-stop-start action related to <u>release of direction of movement</u> without the complete release necessary in the shift to a different target. The magnitude of the act and the interrelationship of all factors and processes involved must be kept in mind by an observer when the pursuit abilities of a patient are being investigated.

B. Move the bell slowly and smoothly through the four cardinal directions of ocular movements. Repeat each movement to ascertain whether repetition brings improvement or increased difficulty in the ocular performance. Ask the patient

to use a forefinger as a pointer to see whether hand movement affects the ocular behavior.

'atch for:

1. The fluidity of the ocular movements and the teaming of eyes as attention is kept on the bell while it is being moved in the horizontal, vertical, and diagonal directions.

If the observations made on each phase of the fixation sequence above indicate that high grade ocular control has been acquired, we have usually expected to find all ocular pursuit movements quite fluid and smooth. However, reports reaching the authors, and our personal experience with this test, certainly lead us to believe that no patient has completely adequate eye movements. The only exception here as mentioned above, is the child or adult who has had visual guidance or visual training.

The preschool years, and the everyday activities of most adults, do not ordinarily include opportunities for pursuit experience. Most of our visual activities are such that eye movements are saccadic in nature, and actual pursuit experiences are quite rare. Control of these movements cannot be acquired without the experiential situations which would create a demand for this sort of ocular movement. As we realize this, we can better understand why basic visual training has been so effective for so many patients, and we need to give further consideration to the developmental sequence as it applies to the control of ocular movement.

For many years our favorite techniques for developing ocular movement skill included some rotational device. This was an effective technique on many patients, but some never quite mastered rotational ocular control, and drill, drill, drill did not seem to be the answer either. Dr. Carl Marsden found that a swinging ball was more effective, and everyone who followed his recommendations was happier with the training room results. When we analyze the two techniques - rotations vs. swinging ball - we can immediately see why straight-line ocular movements are easier for the patient to acquire. Rotational movements demand a complete balance and interrelatedness of all twelve extraocular muscles. Certainly a horizontal pursuit movement involves all these muscles, too, but not to the same degree of extension or contraction of each muscle for each point in the movement. The basic philosophy of the developmental concept demands that first things come first, and because of this, the less complex movements need to be developed before the more complex can be satisfactorily acquired.

Again, in this area of investigation of eye movements, the degree of teaming which has been acquired by the patient can be very important to our analysis of the entire case. If the tests of fixation ability show an unstable eye, the investigation of pursuit abilities can assist in a differential diagnosis of the problem.

This is done by comparing the monocular pursuit performance with the binocular performance. Here we can differentiate four types of children: those whose visual development is markedly retarded; those whose development is progressing, but who are slow; those whose development is atypical; and those who are developing normally.

In the first group (markedly retarded visually), we can expect to find difficulty in both monocular and binocular pursuit movements. Their pursuits will be uneven and jerky; they will lose the target frequently, and will generally be unable to make a satisfactory following performance. These observations will be true of each eye alone and of both eyes together. At no point in the examination is their performance adequate in either eye or in both eye tests.

Such children have not learned ocular control. Their performance is such as we would expect from a very young child. There is no specific problem, but rather a normal developmental process which is behind schedule. They are usually in severe difficulties where achievement is concerned because their visual development is so markedly retarded. One could almost say that visual development had not yet begun. Treatment must begin with

very basic sensory awarenesses and gross motor control. Later we can progress to finer motor coordinations and direct pursuit training.

The second group of children (slow in development) have begun the process of visual development in a normal fashion, but are proceeding so slowly that their performance level is below what we would expect for their age. There is nothing wrong with their development. They are just not learning the basic skills rapidly enough. They require additional help in normal learning activities.

On examination such children are characterized by a difference in performance on monocular tests as compared with binocular. Monocular pursuits are good. Where there is trouble, it is very minor and is not consistent. That is to say, it will show up on one test and not on the next. It will be present at one time, and fifteen minutes later it will not be present, or immediate repetition of the test may show improvement. Binocular pursuits, on the other hand, are poor. The skills which the child shows with wither eye are not possible when we ask him to use two eyes together.

Therefore, when we see monocular pursuits markedly better than binocular pursuits, we can suspect developmental retardation. For some reason or other, this child is learning too slowly. He needs help in learning, but this help should be in the nature of intensified normal experiences. This child is normal. He is just slow. What we do for him must recognize his normality and merely augment normal experiences and normal learning conditions.

When the dangled bell indicates this type of underdevelopment, we can guess that training will require just enough monocular work to maintain the skills he has already developed and, to be sure, we do not do something that disrupts these skills. The bulk of the training will be binocular. We will need to build up all of the clues to binocularity and create situations which are high in binocular demand.

It might be well to emphasize here that monocular training can be overdone to the definite disadvantage of the child. This is frequently the child who is brought in because "Grandma keeps telling us that Johnny is crosseyed. She sees it every time she comes to dinner at our house." On questioning, Grandma sits directly across the table from Johnny, and she notes that one eye does not straighten when he looks up at her.

This child usually shows poor release on the fixation tests, but it may not always be observed there. Some of these children have been patched "to strengthen the weak eye" and are actually worse because of the patching. Having been deprived of the opportunity to develop binocular skills, these children go on developing unilaterality, and monocularity. If the patching was done over an extended period of time, they may even show lowered visual discrimination and a trend toward an amblyopia in the eye which has been covered. Here, especially, do we need every <u>bilateral</u> activity we can devise to furnish every possible clue to binocularity in the visual system. In such cases, two-handed chalkboard routines, and polaroid or anaglyph ring techniques might well be used before pursuit training is instituted. Since basic teaming was not achieved by the child, he must be given the opportunity to achieve the combination of sides before he is required to attempt the fine binocular balance and interrelatedness mentioned earlier in this paper.

Occasionally we find a child in whom binocular movements appear to be good but in whom monocular movements are poor. With both eyes, he follows the bell quite well. However, as soon as one eye is occluded, he is lost, and his performance breaks down. Actually, if you look very closely at his binocular performance you can see that it is not as good as it looks. It is stiff and stilted. If you move the bell laterally for several trials, for instance, and then shift without break to a slight diagonal movement, you can see him start, display tension and hesitate. However, on superficial examination his pursuits would be described as good binocularly and poor monocularly. As this child is very carefully observed, you will usually note some degree of head turning, especially on test repetition. He will follow your instructions to keep head

still as long as he can but will unavoidably slip into head turning as he is required to continue the pursuit task.

Such a child would fall into our category three (atypical development.) He has yielded to the demands for binocularity in his environment. However, at the time the demand occurred he was not yet ready for binocularity. The result was an adaptation instead of an achievement. He has learned how to simulate binocular performance. He has met his demands by learning a specific ability which will solve a specific problem. Because of his lack of more basic development, this was the only learning and the only solution open to him.

We find him, when we see him now, with an isolated skill plastered onto the developmental sequence, so to speak, and not integrated into the rest of his development. As long as this skill can operate in a highly stereotyped manner, he gets along well. However, when the slightest alteration is required (as when one eye is occluded), it breaks down.

Such a child, of course, is in constant trouble. The environment is not sufficiently consistent to allow such rigid performance. Always he is being required to vary his performance in ways which he cannot do. As a result he shows all kinds of problems. His reading is poor, and his arithmetic is horrible. He is a social misfit and either plays by himself or is constantly in a fight. He can't play games, and his attention span is short. In almost any area of achievement or behavior he is in trouble. Lonely and ashamed, he continually fights a battle which he cannot possibly win.

Helping such a child is also a problem. He can be expected to get worse before he gets better. When he begins to get worse, he develops anxiety. His anxiety causes him to resist or refuse further training. We must be very careful at all times in the course of his training. We must move slowly and be very sure we have given him adequate monocular skills before we permit his binocular trick to break down. When he is forced out of his adaptation, he must be able to move at once to a good solid performance. We will give him a lot of monocular work and move only very slowly into binocular. As we move into binocular, we will be very sure that the performance we require is possible without disrupting him. We will break up his undesirable adaptation only after we have built a performance which makes it no longer necessary.

A word is necessary here concerning the child whose monocular performance is markedly better in one eye than in the other. This child has encountered unusual difficulty in acquiring control of one eye. His difficulty may be due to an incipient squint, a neurological lesion, an unfortunate learning experience or any of a number of other specific problems.

We will need to give him special help with the eye with which he has a problem. We must not, however, concentrate on this eye to the point where we forget the total process. We must keep encouraging him to use this eye as a part of a total binocular movement pattern.

This child may fall into either category two or category three above. We cannot decide which until we can determine either from the case history or from further observation on progress report examinations, whether the problem is merely a slowing of normal developmental process or whether it has forced an adaptation. In many cases we shall have to work with the child for a while before the basic nature of the case becomes apparent.

Our final category includes those children in whom the developmental process has occurred normally and is continuing at a normal rate. Such children display basically normal pursuit movements in response to the dangled bell. If they have troubles, they are minor and temporary, indicating only that a normal learning process is not yet complete. We may want to offer them help to increase their learning, but we shall keep such help within the normal pattern.

Thus the simple dangled bell test can give us important information about the general nature of the case. It can help us to predict what will need to be done and what difficulties can be expected in accomplishing our goal. It can suggest

very basic sensory awarenesses and gross motor control. Later we can progress to finer motor coordinations and direct pursuit training.

The second group of children (slow in development) have begun the process of visual development in a normal fashion, but are proceeding so slowly that their performance level is below what we would expect for their age. There is nothing wrong with their development. They are just not learning the basic skills rapidly enough. They require additional help in normal learning activities.

On examination such children are characterized by a difference in performance on monocular tests as compared with binocular. Monocular pursuits are good. Where there is trouble, it is very minor and is not consistent. That is to say, it will show up on one test and not on the next. It will be present at one time, and fifteen minutes later it will not be present, or immediate repetition of the test may show improvement. Binocular pursuits, on the other hand, are poor. The skills which the child shows with wither eye are not possible when we ask him to use two eyes together.

Therefore, when we see monocular pursuits markedly better than binocular pursuits, we can suspect developmental retardation. For some reason or other, this child is learning too slowly. He needs help in learning, but this help should be in the nature of intensified normal experiences. This child is normal. He is just slow. What we do for him must recognize his normality and merely augment normal experiences and normal learning conditions.

When the dangled bell indicates this type of underdevelopment, we can guess that training will require just enough monocular work to maintain the skills he has already developed and, to be sure, we do not do something that disrupts these skills. The bulk of the training will be binocular. We will need to build up all of the clues to binocularity and create situations which are high in binocular demand.

It might be well to emphasize here that monocular training can be overdone to the definite disadvantage of the child. This is frequently the child who is brought in because "Grandma keeps telling us that Johnny is crosseyed. She sees it every time she comes to dinner at our house." On questioning, Grandma sits directly across the table from Johnny, and she notes that one eye does not straighten when he looks up at her.

This child usually shows poor release on the fixation tests, but it may not always be observed there. Some of these children have been patched "to strengthen the weak eye" and are actually worse because of the patching. Having been deprived of the opportunity to develop binocular skills, these children go on developing unilaterality, and monocularity. If the patching was done over an extended period of time, they may even show lowered visual discrimination and a trend toward an amblyopia in the eye which has been covered. Here, especially, do we need every <u>bilateral</u> activity we can devise to furnish every possible clue to binocularity in the visual system. In such cases, two-handed chalkboard routines, and polaroid or anaglyph ring techniques might well be used before pursuit training is instituted. Since basic teaming was not achieved by the child, he must be given the opportunity to achieve the combination of sides before he is required to attempt the fine binocular balance and interrelatedness mentioned earlier in this paper.

Occasionally we find a child in whom binocular movements appear to be good but in whom monocular movements are poor. With both eyes, he follows the bell quite well. However, as soon as one eye is occluded, he is lost, and his performance breaks down. Actually, if you look very closely at his binocular performance you can see that it is not as good as it looks. It is stiff and stilted. If you move the bell laterally for several trials, for instance, and then shift without break to a slight diagonal movement, you can see him start, display tension and hesitate. However, on superficial examination his pursuits would be described as good binocularly and poor monocularly. As this child is very carefully observed, you will usually note some degree of head turning, especially on test repetition. He will follow your instructions to keep head

still as long as he can but will unavoidably slip into head turning as he is required to continue the pursuit task.

Such a child would fall into our category three (atypical development.) He has yielded to the demands for binocularity in his environment. However, at the time the demand occurred he was not yet ready for binocularity. The result was an adaptation instead of an achievement. He has learned how to simulate binocular performance. He has met his demands by learning a specific ability which will solve a specific problem. Because of his lack of more basic development, this was the only learning and the only solution open to him.

We find him, when we see him now, with an isolated skill plastered onto the developmental sequence, so to speak, and not integrated into the rest of his development. As long as this skill can operate in a highly stereotyped manner, he gets along well. However, when the slightest alteration is required (as when one eye is occluded), it breaks down.

Such a child, of course, is in constant trouble. The environment is not sufficiently consistent to allow such rigid performance. Always he is being required to vary his performance in ways which he cannot do. As a result he shows all kinds of problems. His reading is poor, and his arithmetic is horrible. He is a social misfit and either plays by himself or is constantly in a fight. He can't play games, and his attention span is short. In almost any area of achievement or behavior he is in trouble. Lonely and ashamed, he continually fights a battle which he cannot possibly win.

Helping such a child is also a problem. He can be expected to get worse before he gets better. When he begins to get worse, he develops anxiety. His anxiety causes him to resist or refuse further training. We must be very careful at all times in the course of his training. We must move slowly and be very sure we have given him adequate monocular skills before we permit his binocular trick to break down. When he is forced out of his adaptation, he must be able to move at once to a good solid performance. We will give him a lot of monocular work and move only very slowly into binocular. As we move into binocular, we will be very sure that the performance we require is possible without disrupting him. We will break up his undesirable adaptation only after we have built a performance which makes it no longer necessary.

A word is necessary here concerning the child whose monocular performance is markedly better in one eye than in the other. This child has encountered unusual difficulty in acquiring control of one eye. His difficulty may be due to an incipient squint, a neurological lesion, an unfortunate learning experience or any of a number of other specific problems.

We will need to give him special help with the eye with which he has a problem. We must not, however, concentrate on this eye to the point where we forget the total process. We must keep encouraging him to use this eye as a part of a total binocular movement pattern.

This child may fall into either category two or category three above. We cannot decide which until we can determine either from the case history or from further observation on progress report examinations, whether the problem is merely a slowing of normal developmental process or whether it has forced an adaptation. In many cases we shall have to work with the child for a while before the basic nature of the case becomes apparent.

Our final category includes those children in whom the developmental process has occurred normally and is continuing at a normal rate. Such children display basically normal pursuit movements in response to the dangled bell. If they have troubles, they are minor and temporary, indicating only that a normal learning process is not yet complete. We may want to offer them help to increase their learning, but we shall keep such help within the normal pattern.

Thus the simple dangled bell test can give us important information about the general nature of the case. It can help us to predict what will need to be done and what difficulties can be expected in accomplishing our goal. It can suggest

what general types of training activities we shall want to use and what types of activities we shall want to avoid or postpone.

In the November paper in this series we stated that wherever possible we would provide validation and verification of the tests to be described in this series. The literature on some of the tests is very extensive and needs careful study, by someone who has full time to devote to it. We have found some excellent references on the use of dangled rings as targets for the observations of ocular fixation and pursuit movements. These we will present in next month's paper with case examples and a summary of the dangled bell tests.

We would like it very much if each reader would continue to make the dangled bell test on every patient regardless of age. We wish to start relating this test to all other tests in the sequence of examination routines, and the more observations of ocular motor behavior you can make, the more the high correlation between tests will become apparent to you.

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

RELATED TESTS AND RESULTING SYNDROMES

February - 1958 Series 2 No. 5

The syndromes of visual performance have be n one of the most significant contributions made to optometry by Dr. A. M. keffington. His theme for many years has been the totality of vision and its correlations with organismic behavior His constant search for these correlations has set a pattern for all of his associates to follow. Out of his concepts of interrelatedness has come our ppreciation of the syndromes which we h ve been able to establish in the series f tests now recognized as basic investigations of visual development.

Dr Skeffington and many of those who have followed and assisted in the extensi n of his concepts of the dynamics of visual performance have probed all possible areas of behavioral literature. It is quite interesting to note that many scientists are still unaware of the totality of the human being. These people spend a lifetime investigating single aspects of human behavior or development with ut knowing what is being done by others in related fields. They know of the investigations being carried on by colleagues in a similar area, but are not aware of the broader, concurrent, w rk which many times could give them more adequate answers in their own field. W , in optometry, owe Dr. Skeffington a debt of gratitude because he has led us over or around interdisciplinary walls f r the wealth of information which is pertinent to our greater understanding of vision. This is especially true in the area of children's visual care, and the spread of optometric interest into the fields of child development.

As we look into this field, and the literature from it, we find that there has been much attention given to ocular pursuits as tests of infant intelligence. This li erature is illustrative of the lack of a Gestalten in the approach to child development. Ocular pursuit tests have long been a part of infant intelligence tests, but the visual aspects of these tests were not related to intelligence, until optometry recognized and investigated the correlation.

The very people who use this test for an appraisal of infant intelligence have difficulty with the optometric concept that vision and intelligence are one and the same. However, it is true that the earliest attempts at investigating ocular behavior of the small child furnish the background and the validity for our present syndromes which include the dangled bell. Further, since this technique has been used extensively by psychologists and neurologists, we in optometry have a common ground for discussion with the more informed representatives of these fields.

In the investigations reported in the literature, a target was presented, and the observer noted whether or not the child turned toward the target. At a little later age, the target is moved across the visual field and the observer notes whether the child follows the target. These two observations are the performances we in optometry know as "reach and grasp." Gesell (1) added release to the concepts, and we in optometry elaborated and applied it also.

In like manner, tests are reported in which the examiner can observe whether the child makes an attempt to obtain the object with his hands and the accuracy with which he succeeds. Few, if any, of the non-optometric investigators recognized or commented about the role of eye-hand coordination. Here, again, Gesell (1) recognized the dynamics of the visual-tactual relationships, and from his con-

tributions optometry elaborated the clinical applications.

According to the literature, one of the most frequently used infant intelligence tests employs the following items (2):

<u>At two months</u>: Follows Ring in Horizontal Motion.

An embroidery ring is suspended by a string, about eight inches from the child's eyes, while he is lying on his back. The ring should be moved about in different directions to attract attention. The item is considered passed if the child's eyes follow the target continuously as it is moved in a horizontal arc.

<u>At two months</u>: Follows Moving Person.

The examiner walks back and forth within easy view of the child. This item is considered passed if the child follows the examiner with his eyes.

<u>At two months</u>: Follows Ring in Vertical Motion.

Same as ring item above except that ring is moved in vertical direction.

<u>At three months</u>: Follows Ring in Circular Motion.

Same as above except that ring is moved in a circular motion.

<u>At three months</u>: Regards Cube.

A one-inch wooden cube is placed on the table within reach of the child who is in a sitting position. Item is considered passed if child directs his eyes toward the cube and holds them there after examiner's hand is removed.

<u>At three months</u>: Regards Spoon.

Same as above except that an aluminum teaspoon of standard size is used as the target.

<u>At four months</u>: Follows Ball Across Table.

With the child seated at a table, a bright red rubber ball 1 1/2 inches in diameter is placed to his right but within easy view. When the child turns his attention to the ball, it is rolled across the table. The item is considered passed if the child definitely follows the ball wit' his eyes.

<u>At five months</u>: Attains Ring.

With the child lying on his back, the embroidery ring is dangled in his line of vision eight inches before his eyes. Credit is given if the child is able to grasp the ring at least twice.

From these illustrations it can be seen that the observation of behavior of the eyes in response to a moving visual target has been the concern of psychologists and others interested in child development for some time. In general, these activities have been investigated at very early age levels. The concern has been whether or not the response occurred, not with the quality of the response.

A number of target materials have been used for such tests. The ring and cube cited above have probably been the most popular. The specific use of a cat bell as a target appears to have resulted from the work of Gesell and of Getman (1).

Neurological examinations have also traditionally used moving objects as test situations (3). Targets have included bright colored objects and usually a penlight or similar target. The regularity of the ocular movements in pursuing the target was observed, but here, also, the presence or absence of movement was of prime concern, and no attention was given the quality of the ocular movements.

Out of all this background we can recognize that syndromes develop from the study and investigations of many observers, <u>but</u> the meaningfulness of the syndromes is built by those who recognize the dynamic interrelationships in total behavior.

In optometric practice the dangled bell test and retinoscopic observations of refractive status are the first pair of findings in the syndrome of basic visual behavior. In the opinion of your authors, the correlations that can be gained from these two tests is primary and essential

to an adequate analysis of visual performance in any of the more elaborate or complex tests commonly used. Before proceeding in this series to the details and significances of retinoscopic observations, we want to include some case examples. These will illustrate further that no single test, regardless of its basic significance, is sufficient for the analysis of visual development.

H.M. boy, age 6, 1st grade Parents noted his squinting, which increased as the day went along, and his mother, especially, noted that he held books or toys very close to his eyes. They also reported he was a very tense and irritable child.

Our first examination was very difficult because he did not speak a single word during the hour he was in the office. We could not get any acuity measurements. However, we did determine by his pointing that he correctly judged the first five signboards in the skills battery.

Ocular pursuits were entirely lacking, and there was complete head movement. Even this was jerky and confused. He would move his head opposite to the direction of bell movement and would frequently lose the target. Ocular fixation was very difficult anywhere on midline but most tedious inside 14 inches. The closer the bell came to his face, the more he squinted and frowned. Either right or left eye released and turned out at 8 inches, and repetition of the test showed poorer and poorer performance. Vertical and diagonal pursuits were entirely nonexistent.

H.M.'s myopic mother, interpreted the boy's squinting as a symptom of distance blur which she had experienced in childhood. Our retinoscope findings were interesting, and the first look with the retinoscope indicated about a -1.25 for #4 finding when the reflex was bright! Near retinoscope (#5) was extremely variable, and there was an increase of "against" motion when he attempted to discriminate the near attention target. This reflex would also fade and show definite "with" motion when he lost fixation on the near target.

He was given home training routines because of the 60-odd miles of traveling involved, and because his parents were both eager to avoid the visual problems they will carry all their lives.

Progress report on H.M. showed a tremendous improvement in all ocular motilities, and the parents reported the squinting reduced after 8 days of swinging ball training, near-to-far fixation, and saccadic fixation routines. He had entirely ceased to squint on the P.R. examination, and the #4 finding was -.25 with #5 a rather stable +.75. Schoolwork had immediately improved with "lots of 100's." Proper lenses (which will be discussed in following papers on the retinoscope tests) were given H.M., and further progress reports have shown continued gains in ocular, visual and school performances.

Here we have an illustration of accommodative performance as a derivative of convergence ability. This boy was not a myope <u>yet</u>. He would have seemed an extreme myope if we had not looked at his basic ocular motilities in relation to standard analytical tests. If we had not recognized the underlying problem, our attack on the "myopia" would have been a failure, and plus at near would not have been integrated into his performance to his advantage.

L.S., girl, age 9, 4th grade, was examined because of frowning and eyes watering at reading or T.V. She lost her place frequently after reading for 10 minutes, and reported that she needed to close one eye "a little bit" when doing school work. When asked why she closed one eye, she replied, "Just a habit, I guess."

On the bell, she fixated with much effort, left eye wavered and would lose fixation entirely. She spontaneously closed her left eye, and pursuits became more jerky and erratic as we continued. Movement of eyes in each meridian (horizontal, vertical, and diagonal) were fair the first time only, and any repetition showed her left eye drifting immediately.

All findings in the analytical were variable and erratic. Phorias ranged from 12 to 5 exo. on a single test. She constantly pulled out of the refractor, and on near findings would rub her eyes between

each test. Her answers were uncertain and confused - as if she did not see the same target referred to in the examiner's questioning. This was a typically "uncooperative" child, and would have been so classified by many examiners who gave no attention to her basic motility skills. Such an analytical sequence can be chained and typed, but its syndromic validity would be lacking. This is a case where more attention must be directed to the underlying basics for a developmental sequence than to the performances in the analytical tests themselves. All of these tests are colored by the basic inabilities, and the case picture is incomplete without the dangled bell test results.

V.K., male, age 37, farmer. Has had many "examinations" and many pairs of glasses. "I have a lot of halos and blurry edges on things I look at. I can't read at all because I can't keep it clear, and I have more headache if I try to do it. I get dizzy if I change point of attention quickly. Every doctor I've seen said a change in my lenses would cure my troubles."

V.K. was wearing +2.00 spheres, and the analytical examination showed no change in prescription. However, phorias were variable from 2 eso. to 2 exo. to ortho. on every phoria test. All ductions were extremely low, with no blur findings, and recoveries were zero or minus. All visual abilities tests were excellent, with the exception of retinal alternation. This showed decidedly fewer cycles of change at near than at far.

Dangled bell showed pursuits extremely jerky and erratic. There was no motility, and head position had to be adjusted and readjusted to maintain fixation. Furthermore, response was very slow and difficult, with observable effort on V.K.'s part in both grasp and release. He commented: "It seems like my eyes do not work together, and I can only see the bell when I wait for my eyes to settle down. If I move my head, I don't have to wait for my eyes."

Here, also, visual training on basic motilities cleared the problem, and each progress report shows a steady, continuous gain in visual performance. This patient, age 37, had to progress through stages of visual development to gain the skeletal motor skills and controls which would allow the visceral system to gain reach, grasp and release. For many years - and, maybe, for most of the 37 - this patient had turned his head rather than turn his eyes. He continued to build the magnitude of binocularity he could, and superficial examinations showed "no problem" other than his need for plus lens. His was the traditional "structure on sand," and the stresses of daily visual demands proved the lack of a firm foundation.

V.K. reported on his last progress report that he now turns his eyes rather than his head. He told us that he now makes a point of seeing how still he can hold his head and how quickly he can move his eyes from side to side to glance at things around him. He is applying the principles of "vision is output," and has commented to us with real enthusiam that he is now aware of his eyes as machines for seeing and enjoying his world instead of being aware of his eyes as the source and location of constant discomfort.

We have already begun the discussion of retinoscopic tests. No discussion of vision can be limited to any single aspect of it. Next month, we shall start the detailed discussion of retinoscopic methods and the many significant observations we in optometry can make with a retinoscope. Since we recognize the dynamic aspects of visual performance as being more significant than static measurements, we can begin to discuss the refractive status of the ocular mechanism rather than "refractive errors." Because of the importance of the refractive status in our consideration of visual behavior and performance, we hope you will continue to make the dangled bell test on every patient - and now start relating it to your retinoscopic observations of refractive status. Make careful notes of your observations on the bell test, and compare the retinoscopic findings with your judgments of reach, grasp and release in centering. You will undoubtedly begin to see correlations between an unstable centering process on the bell and variations in refractive status as observed with the retinoscope.

In next month's paper, we shall start discussing the reach, grasp, and release factors in the identification processes of visual behavior.

REFERENCES

1. Gesell, A., Ilg, F. L., Bullis, G., Getman, G.N., and Ilg, V. Vision - Its Development in Infant and Child. New York: Hoeber, 1949.

2. Cattell, P. The Measurement of Intelligence of Infants and Young Children. New York: The Psychological Corporation, 1940.

3. Denhoff, E. and Holden, R. H. Pediatric Aspects of Cerebral Palsy. J. Pediat., 39, 1951, 363-373.

VOLUME 30 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPTOMETRIC EXTENSION PROGRAM · 1928

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE RETINOSCOPE

March - 1958 Series 2 No. 6

As time and clinical experience continue, more and more consideration must be given the light and mirror arrangement called a retinoscope. Many authors have named the ophthalmoscope as the significant instrument for exploration of the eye and its well-being. The ophthalmoscope frequently appear in the literature, and much credit is given to Helmholtz for its invention in 1851. In our search of the literature we found few details on the retinoscope's origin or who invented it. Joseph I. Pascal credits it to Cuignet, a French physician in 1873, and to a William Bowman in 1861.

The Optometrist's Manual first published in 1897 by C. H. Brown, M.D., discusses the ophthalmoscope* as follows (9):

"The ophthalmoscope, which was formerly looked upon as an instrument for use by the medical faculty alone, has now a place in the outfit of every well-equipped optometrist. It is not unusual, however, to find among the less experienced optometrists an exaggerated and erroneous impression as to the purposes for which an ophthalmoscope should be used, and the information that can be derived from its employment. Some of these optometrists entertain such an exalted opinion of this instrument, that it appears as if they must be under the impression that when they look into an eye with the ophthalmoscope, they will be able to see stamped in the eye, in plain figures, the number of the glass required to correct that particular case. In fact, the ophthalmoscope is looked on by some optical students and optometrists as a magical and mystical instrument with a mysterious something about it which makes it difficult to understand its use, but which, when comprehended, affords them an infallible method for fitting the most difficult cases, to the exclusion of every other means."

This same author makes the following comments regarding the retinoscope:

"The more complete trial-cases usually contain one of these instruments, the use of which is at present attracting the attention and engaging the interest of all progressive optometrists.

"Retinoscopy, or keratoscopy, or pupilloscopy, or skiascopy, or the shadow-test, as it has been variously termed, is a valuable auxiliary method for determining the refraction of the eye, and it is one which the optometrist cannot afford to neglect. It is especially useful in the examination of children or of uneducated persons."

Dr. Brown's remarks about the retinoscope "attracting more attention" is certainly more true today than it was sixty years ago. When one considers the developments of the past ten years and the emphasis on the retinoscopic observations, Dr. Brown was more prophetic than he knew.

The literature contains many, many pages of discussion of the importance of the retinoscopic measurements. Whole books have been written on the importance of exact accuracy. In 1930, Dr. Joseph I. Pascal, writing in his book,* Modern Retinoscopy (8) stated:

"IMPORTANCE OF RETINOSCOPY.-The examiner who does not use retinoscopy in each and every one of his refractive cases deprives himself and his patients of the most important objective test within his reach. It can be readily shown how the use of the retinoscope shortens the examination time and renders the examination more pleasant for both patient and examiner. In addition, it makes the correction much more accurate,

especially with children, illiterates and persons speaking a foreign language. In fact in some such cases it is the only method that can be used at all for making the examination.

"But in saying this, one need not overestimate the method and go to the other extreme. It is not advisable to prescribe from the retinoscopy findings alone, except where the subjective tests cannot be made. A complete examination should include an objective as well as a subjective test for both far and near. One test checks and supplements the other. We have such an objective test for far and near in static and dynamic retinoscopy, respectively.

"It is, in general, best to make the retinoscopy test before the subjective test. The retinoscope acts as a path-finder and gives at least an approximate correction, without annoying the patient with any questions. Occasionally it may be desirable to re-check objectively after the subjective tests, especially where the findings are markedly at variance. Usually it is best to work out the finer points of the correction subjectively wherever possible. But where the retinoscope has been used before this is not the 'long and weary process' of the all-subjective test. How near one can come to the true correction by retinoscopy depends upon many factors. Aside from the ability and experience of the examiner, it depends upon the eye and the kind of patient examined. In some cases the conditions are such that the retinoscopy findings are considerably off. The examiner should not let such occasional cases discourage him. With practice, such aberrant findings will become more and more rare.

"However, it is well to know that, like all methods of examination, retinoscopy can be mastered by some men more readily than by others. The former, somehow have a special knack for it. But every examiner, even if he cannot master its fine details, can learn to use retinoscopy if only for an approximate correction and find it exceedingly worth his while."

In our search of available literature, we have studied twenty-two textbooks either wholly or partially devoted to the retinoscope. Of these, only two books consider the retinoscope as an instrument for observing visual behavior. One of these two quotes the other almost verbatim. All the other authors spend time and thousands of words discussing the importance of accurate "eye measurements."

The one book which both states and implies the real importance of the retinoscope in observing something much more than eyeball dioptrics, must be quoted here* (7) to bring to our attention the fact that optometry made the first real strides <u>back of the eyeball</u> to gain a better understanding of the entire visual mechanism:

"The theory and technique of the retinoscope has been so frequently and so fully discussed that no occasion exists for a further entering into that which still remains a distinctly controversial subject. Irrespective of the argument over theory which exists, there is one outstanding fact to be given consideration in the understanding of the value of the retinoscope and that one thing is, 'if a variation exists in the net finding with the retinoscope at different points of stimulation, under the utilization of a like technique, then there is obviously a fatigue manifesting itself in that particular pair of eyes.'

"It will be noticed from the table of expecteds, the net finding in a pair of eyes, not laboring under an excess fatigue at any point of stimulation, is precisely the same under all the retinoscope finding If such a variation did exist, it is obvio there is being manifested a change in the amount of stimulation being utilized by on of the dual functions of Accommodation and Adduction at that particular point of stim lation, causing an alternation in the amou of innervation being supplied one function or the other, outside of the linked accommodative-adductive relationship.

"This statement, of course, immediately places the interpretation of the retinoscope finding wholly and completely outside of the idea of the determination of the refractive error that may exist in a pair of eyes in the sense of lens applicability. For if it were merely a matter of an eyeball length and a consequent variation from the needed and demanded lens adjustment system, it would be very

easy to ascertain this variation, to supply the additional or required lens power and the entire problem would be cared for. This has indeed, in the past, been considered the scope and role of the retinoscope.

"Men have practiced assiduously for years to perfect a technique whereby they might be able, with the retinoscope, to determine exactly the lens power the patient was to wear. So long as the eye was considered an optical instrument, this was a tenable theory and a laudable ambition. With the coming of the realization that the eye is primarily not functioning as an optical instrument would function, then the role of the retinoscope changes radically.

"In considering the diagnostic value of the retinoscope this fact must be given consideration. A schematic eye adjusted to have one dioptre of hyperopic error, with the retinoscope being used at one-half meter will require a plus-two lens power to neutralize the divergency of the beams of light coming from the retinoscope. With this plus-two lens in place there will still be manifested a motion of the light indicating the need of the plus-one lens for which the schematic eye has been set. If a plus-one lens is then supplied, light will be brought to a focus and a 'neutral' shadow will result.

"It is this neutral shadow in the human eye that all efforts are bent to obtain. If the human eye functioned as an optical instrument, then an eye with a plus-one dioptre error, being examined with the retinoscope from a twenty inch distance, with a plus-two lens placed before the eye to neutralize the divergent beams of light, as with the schematic eye (with the patient actually reading and focusing on a fixation object simulating infinite distance, which would be proof of the fact that a focus was being obtained), should show a 'neutral' motion also, as did the schematic eye.

"All users of the retinoscope, however, know that this is not the case. That in the human eye, with the conditions as above stated, there will still be a 'with' motion even though the eye is showing the existence of a focus by its ability to read normally at an infinite distance. This can hardly be attributed to lag for if the given amount of suspected lag is supplied with a plus lens the remainder of the error will still manifest its presence by 'with' motion until it has been neutralized by the full power of the plus-one lens.

"It becomes obvious that a true apprehension of the under-lying truth is contained in the basic law of diagnostic refraction, 'Any refractive error, determined objectively or subjectively, is merely the measure of the end result in dioptre-units of the amount of innervation, being utilized in accommodation, over and above the habitually linked accommodative-adductive relationship, at a given point of stimulation, at a given time.' Therefore it must be evident that any amount of energy being expended to maintain a focus through the crystalline lens will be measured in terms of the plus lens when that energy is being expended outside of the linked accommodative-adductive relationship.

"It may be a hard saying but nevertheless a truthful one, <u>that the refractionist is dealing not so much with the eye itself, but almost entirely with the brain</u>,* (10) more important than that, dealing with an habitual association of energy to two different muscular systems and with the interference in this ratio brought about by the fatigue efforts of modern civilization. It is not necessary to go into a discussion of technique here. Suffice to say that three things are essential (a) definite and sufficiently intricate fixation object that constant questioning can be made of the patient in order that the refractionist may be sure the conscious mind is associated dynamically in the visual act· (b) an adequately and consistently illuminated retinoscope beam, and (c) the ability on the part of the refractionist to read the true inherent meaning of his findings when they are obtained.

"Let it be clearly understood, however, that no matter what method is employed, when the retinoscope beam is actually passed across the macula of an eye, that eye is, for all practical purposes, excluded from the visual act."

This book was written by Dr. A. M. Skeffington in 1931. Although he has

progressively changed some of the terminology as a greater understanding of visual performance has been gained his basic concept of "the conscious mind (being) associated dynamically in the visual act" is more meaningful today than ever before. In our opinion this concept has been the turning point from eyeball refraction to functional visual care and guidance. This is of greater significance than we have perhaps realized, and gives us a philosophy out of which standard retinoscopic procedures and "book" retinoscope observations can be analyzed.

This contribution to our understanding of visual performance was essential to the advancements in techniques and concepts which allow the correlations and comparisons of visual behavior and general behavior. As we became aware of the philosophy of Developmentalism, it made sense to optometrists because the static concepts had already been judged inadequate for interpretation of visual behavior. The patterns of performance in the visual mechanism and the patterns of performance in general behavior of the total organism could now be related to each other. As this was done, the dynamic aspects of the organism's contribution to every test situation was recognized by optometrists, and the exact retinoscopic measurements of the eye were replaced by accurate observations of visual response to a task situation.

As this concept was further developed, we found the targets used for patient attention were more significant to our "Measurements" than were the conditions of the eye ball itself. Here was another important relationship between optometric philosophies and the developmental philosophies, and especially the contributions of Gesell. He has added the dynamics of performance to the consideration of children's behavior, just as Skeffington has added these dynamics to our consideration of visual behavior.

Out of these interdisciplinary relationships has come a greater appreciation of the retinoscope as a "tool" for observing total behavior. The experienced observer can now judge many aspects of general or total performance with his retinoscope.

The techniques of use are no different than we learned in optometric college, but the interpretations of the "measurements" are greatly different. We need not go into instrument technique for this reason. In passing we shall discuss the importance of proper targets as part of the method which is most appropriate, however.

Last month we stated that we would discuss the reach, grasp, release sequence in the ocular visceral system. This is undoubtedly the best place to start a discussion of our retinoscopic observations because of the confusion which can exist when neutrality of the reflex is our goal on #4 and #5 findings.

Before we gained an understanding of reach, grasp and release, patients were frequently described as uncooperative or inattentive because a retinoscopic neutral was difficult to obtain. Few examiners wished to admit that their technique was faulty, and some of the early authors insisted that the retinoscope findings at far-point and the subjective findings had to be the same, or there was a lack of accuracy. The Optometric Extension Program was one of the first to recognize that there could be, and frequently should be, differences in #4 and #7.

The work with children of preschool age which led to the book, VISION - ITS DEVELOPMENT IN INFANT AND CHILD, gave evidence and emphasis to the validity of these differences in test results. First of all, we became aware of the differences in developmental rate and sequence in the visceral system. Next, we realized that the processes of development in every action system would show differences to alert observers, as the child progressed through time. These variables are indicative of his progress - not symptons of difficulty. This work done at the original Clinic of Child Development re-emphasized the need for continuous observations rather than single visit decisions and diagnosis. Further, these studies of very young children provided us with a fuller realization that a child develops his visual abilities in near space and then expands these abilities to far space. Although we were able to verify these observations in the stereoscope, it was the retinoscope that gave

us our most conclusive evidence.

Many readers of this series have heard the descriptions and accounts of these retinoscopic studies at the original Gesell Clinic. They bear repeating here to provide background for the discussions of visual behavior to be presented later in this series.

The first retinoscopic observations were made in children approximately 30 months of age. We found out very quickly that it was most difficult to obtain information with a scope because many of the children were "uncooperative." They looked at the scope light instead of the wall chart; or they wanted to see the working distance lens held before their eye; or the would not let us place the lens before the eye we wanted to scope; or if they submitted to the test situation, the reflex was so fleeting there was no opportunity to obtain a neutral. Miss Glenna Bullis, who must have enormous credit for the significant results obtained in these early studies, knew children so well that she was able to clear the hindrances described above. It was her recognition of the inadequacies in our methods which allowed us to resolve the problems encountered in examining these young children.

Targets which were more suitable because of their interest value to a small child were devised. The working distance lens was discarded, and the observer learned to estimate the speed of the reflex. The child was carefully shown what the lens was, and frequently given one that he could hold in his own hands. In some instances the examiner moved to far-point with his retinoscope to avoid distractions for the youngster. By working with each child as the situation demanded, an entire series of line drawings were produced which would hold the child's attention, and because of their meaningfulness to him, it was then possible to go on with retinoscopic studies of each child. By the time we had examined a large number of children in the age range from 12 months to 5 years, the set of drawings which were most effective with the most children were well determined.* (11)

Over the years since the first reports on this work, many men attempted to do their scoping from the screen or wall chart position. They encountered so much difficulty they felt there might be some error in our original accounts. Investigation showed that the scope they were using did not have a bright enough light source, and frequently the reflex was so fleeting that it was too difficult to estimate. We should still like to suggest that every examiner do some scoping from a distance of 16 to 20 feet just to get some practice in estimating the speeds and brightnesses of the reflex under these conditions.

It is important to emphasize again that the target used must have a high interest value for the child. This is true, of course, no matter what method of retinoscopic observation is utilized. As one becomes more adept at scoping the young child, he will be able to manipulate targets so that some of the problems which can exist, just as they did for us 12 years ago, need not arise. As the method of presentation and choice of targets becomes established, every examiner will be free to pay fullest attention to the reflex.

Analysis of the retinoscope itself is unnecessary. It is important to remind ourselves that every scope in good working order is nothing more than a constant light source. It operates as it does because the retina of the eye acts as a reflecting surface to return the light so that we may see it. Actually, during far retinoscope observations when optical factors are qualified with a working distance lens, and during near retinoscope observations when target and scope are in the same plane, the retina becomes the "light source." Thus, the variables in speed, brightness, color and durability of the reflex are all related to visual behavior rather than scope behavior. For this reason, any good retinoscope is suitable, and the observations are possible with every scope, be it streak or spot, regardless of make.

An examiner need not change his scope to get results - he needs to change his point of view from statics of eye structure to the dynamics of visual behavior. As we look at the possibilities for change in the retinoscopic reflex, we must admit that something more than an eye and an instrument are involved. Further, as we

relate the changes we observe retinoscopically with the moment-to-moment changes in activity, the comments of Dr. Skeffington, stated earlier in this paper, become extremely pertinent.

Perhaps it is just an assumption out of the thousands of observations, but it is very logical to state that the visceral system of the eye must also learn to operate. Your authors are convinced that there is nothing inherent in the performance of the accommodative structures except the gene matrix patterns determined by species membership. Certainly the visceral and skeletal systems operate in degrees of unity because they were designed to do so, but we feel that the ultimate of unity is determined more by the developmental processes and experience in action than by inheritance.

Our conviction grows when these ocular and visual patterns can be compared to similar processes in other performances of the organism. Immediate comparison is possible with the processes of development in hand activity - and of course with the sequences of fixation abilities already described in this series.

The reach, grasp, and release processes in the visceral system were first observed at the Yale Clinic of Child Development when we did the first scoping at a distance of 16 feet from the child. When we were finally able to arrange the testing conditions to provide opportunity for response, the retinoscopic reflexes we saw were easily qualified by the observers. We would see the reflex brighten from a dull brick red to a bright pink as the child searched and reached for the target picture on the screen. The reflex would show a slow "with" motion as it brightened, until the child began to identify the picture. Then the reflex would become a bright pale pink, and the motion would become a rapid "with" or almost neutral.

If the picture was of particular interest to the child, the motion of the reflex would frequently show a slight "against" -- and this reflex would hold as long as the child continued to grasp the picture, naming or describing it to us. When the child was done with the picture, we would see the reflex dull off rapidly. At times, in our early observations this dulling was so immediate we thought our retinoscope had been turned off. Repeated observations showed us that this dulling was characteristic just as soon as the child had completed the identification to his own satisfaction. His release of the target was always accompanied by the dulling of the reflex.

In our discussions of the observations made, we wondered if the reflex really did dull off, or if the child shifted his attention so that the light beam was not directed into his eyes. Thereafter we paid careful attention to this dulling. One of us would watch eye positions, and the other would watch the brightness of the reflex. Almost without exception in the younger children, the dulling preceded the shift of eye position.

We then returned to the brightening phase to be sure the child had his eyes directed to the picture screen when we saw the reflex change from dull red to bright pink. The frequent observations of many children, rechecking on the same child on different days, and the manipulation of targets which each child responded to, gave us the certainty we needed. As a result we knew that we had seen, and could control, the reach, grasp, and release sequence in the ocular visceral system.

Further evidence of this sequence was observed in adults. The trips to the clinic were so spaced that there was an opportunity to make the observations in clinical practice. Adults were watched as carefully as were children. There were a number of postsurgical cataract and amblyopic patients available for observation. Many of the same targets were used with these adults, and we frequently employed the same methods of observation used at the clinic.

We could observe especially the reach-grasp-release sequence in the postcataract patients as they learned to use their newly operated eye. Frequently we could set the stage to elicit the same responses in cases of amblyopia. Thus, we realize that the reach, grasp, and release sequence is typical of every visual system regardless of age. It was this evidence from adults which emphasized that developmental vision

concepts apply to all ages, and are much more than observations applicable only to the young child.

The stability of each phase of the sequence gave us important clues to the degree of binocularity being established by the patient, and this, too, will come in for much discussion later in this series. So far as we were concerned, the final proof of these processes came as we watched the same children at various ages and saw each child in the consecutive stages of developing the basics for visceral binocularity and the teaming in binocular accommodative behavior.

Next month we shall describe our observations of the sequence of monocular - bi-ocular - binocular reach, grasp and release as we saw it with the retinoscope.

Related References

Author	Title	Publisher	Date
1. Atkinson, T.G. & Wall, F.A.	Dynamic Skiametry	Professional Press	1928
2. Betts, E.A. & Austin, A.S.	Visual Problems of School Children	Professional Press (Optometric Weekly)	1940-41
3. Fisher, W.A.	Ophthalmoscopy, Retinoscopy and Refraction	F. A. Davis Company	1931
4. Robinson, S.H.	Oculo-Prism Treatment	Professional Press	1924
5. Tavs, E.G.	Questions & Answers in Optometry	Professional Press	1923
6. Atkinson, T.G.	Oculo Refractive Procedure, Analysis, Treatment	Professional Press	1937
7. Skeffington, A.M.	Differential Diagnosis in Ocular Examination *pp. 48 - 52	A. J. Cox & Company	1931
8. Pascal, J.I.	Modern Retinoscopy *pp. 2 - 3	Hatton Press, Ltd.	1930
9. Brown, C.H.	Optometrist's Manual Vol. I *pp. 216 - 218	The Keystone Press Pub. Date Unknown	1920 approx.
10.	*Underlined by these writers - not by the author.		
11.	*Such slides and pictures are now available from Childcare Co., Box 366, Loveland, Colorado		

VOLUME 30 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE DEVELOPMENT OF BINOCULARITY

April - 1958 Series 2 No. 7

Last month we stated that as far as we were concerned, the final proof of the processes of binocular development came as we watched children in the consecutive stages of developing the basics for visceral binocularity. We emphasized the importance of teaming in the binocular accommodative behavior, and referred to our observations of the sequence of monocular - bi-ocular - binocular reach, grasp and release as we saw it with the retinoscope.

Dr. A. M. Skeffington has frequently stated that accommodative performance is a derivative of adequate performance in convergence. This is a most apparent truism when one takes the opportunity to observe children's visual development as they progress through the first 3 or 4 years of their lives. Children literally spend their first 18 months practicing and gaining the skeletal motor patterns for movement of eyes. During this period, they are learning the abilities necessary for ocular fixations. These are probably the foundations for centering, but centering as we know it in the visual behavior of adults does not fully develop until visceral function has also been established. The interweaving processes, so essential to the totality of the visual mechanism, bring about an integration of the skeletal and visceral systems. This unity gives each system more operational status and ability than either system could gain for itself.

If each system acquires its own abilities in the expected developmental sequence, a gestalt which has all the attributes of the normal visual mechanism results. If either system fails to develop its own abilities, the end result is a deviate, unstable, or inadequate visual mechanism. The deviate visual mechanism has long been thought of as defectiveness because it usually shows up as a "refractive error" or "squint." The unstable visual mechanism has been labeled "latent ametropia" or "latent squint." The inadequate visual mechanism has only been recognized by functional optometry because it usually shows up as "20/20 emmetropia" or "normal eyes" even though visual achievement is lacking. Full analysis of each of these catagories shows them to be developmental in origin, i.e. the developmental sequence of monocular -bi-ocular - binocular reach, grasp, and release was not completed by the child in the preschool years.

In previous papers we have discussed the reach, grasp, and release sequence in the skeletal system. This same sequence must occur in the visceral system if the visual system is to serve its intended purpose. Our first clue to this sequence came when we observed brightening and dulling of the retinoscopic reflex in the very young child. As we carefully reviewed our recorded observations, we found stages of visceral development similar to those we had previously seen in the skeletal system. These are:

Stage 1. Random, limited brightening of the retinoscopic reflex, without pattern, or consistent relationship to cause or event. This brightening is more apparent because it is different than the dull or gray reflex which we have come to associate with "non-function" of eyes. It is not the bright sharp reflex that is seen when we know a patient is visually participating in some ocular task. We do not see it frequently in the older child or adult because this stage is usually passed as soon as the individual becomes visually aware of his external world. It can be observed in an amblyopic eye, however, when the "normal" eye is occluded and demands are made of the "lazy" eye.

Usually this brightening is so fleeting that it cannot be neutralized, and actual

neutralization is unimportant anyway. Infants will show us a shift in dioptrics from slow "with" to slow "against" movements in this stage depending on the status quo. If the baby is comfortable and we get his attention by "kitchy koo" methods, the retinoscopic reflex will brighten and the movement will probably be a slow "with." If the baby is "wet, mad, and hungry," we will probably see a slow "against" motion. Many such cases have been reported where the total dioptric shift has been from +4.00 or +5.00 to -7.00 or -8.00 all in a matter of a few moments.

This stage is like stage 1 described in the December 1957 paper in that it is more related to the biologic patterns of bi-ocularity than it is to the functional patterns which come in later. Personal observations and discussions with other observers certainly indicate that the brightening which occurs in this stage is no more than an indication of the biologic completion of the ocular system. At this level, both eyes usually show a concomitant brightening when it does occur. It is useful to us as an indicator of normal ocular structure and expected neurological proliferation for infancy. It is not an indicator of refractive status. This is the only time when the human eye resembles the schematic eye used by undergraduate students.

Stage 2. An alternate brightening and dulling of the retinoscopic reflex which is more closely related to an immediate situation can be observed. The brightening in this stage is more of a vivid pinkness, but will not hold very long at a time. There is more stability to the motion of the reflex, and it can now be approximately neutralized with trial lenses. Now, also, the reflex does not dull off to the grays seen in stage 1.

This alternation of brightness can be observed monocularly. This is perhaps more significant than the "come and go" of the brightness related to a situation, because we feel this is the same process occuring in the visceral system that we reported as stage 2 in the December paper. The retinoscopic reflex in one eye brightens while the other stays dull. This is followed by a dull stage in both eyes, then the same eye, or the other eye brightens. This is the right or left stage, or as we have described it at Congresses, this is the "one or other"stage.

In the very young child this monocular alternation of brightening is best observed when the child's attention is on near objects. Frequently it is best seen when the child is handling a rattle or a bottle. (There will be further discussion of the distance factors in the brightening of the reflex later in this same paper.) Because this brightening does occur in hand activities, it is frequently seen in the right eye when the right hand is in action, and in the left eye when the left hand is in action. This is very similar to the eye-hand combinations which occur in the fixation sequences previously described. It is as if the visceral system is being reinforced by tactual signals, just as the skeletal system followed the lead of hands The patterns of visual responses are consistent enough that we have accepted this as an organismic response, and as an evidence of the early visual skeletal-visceral interweaving in the ability we later recognize as eye-hand coordination.

Stage 3. Overlapping, or intermittent bilateral brightening of the retinoscopic reflex. This we have previously described as the right and left stage. At this time the young child seems almost to be practicing with each eye, and then trying them together. Careful observations of children will show facial expressions and widening of eyes as if they are experimenting with something new and exciting to them. There will often be definite head movements similar to those in stage 3 of fixation development as if these movements would assist eyes to team.

The retinoscopic reflex is much like the #7 or #8 rotor for the Tel-eye-trainer. Sometimes the same eye will dull and brighten several times before the other brightens. Then there might be a completely alternate sequence which will change from some brightening of each to some brightening of both. This might go as follows: right - left - right, and left with right dulling and left holding; then both dull followed by both bright. The dull and bright periods have no time equality, but as the child continues to attend to the object of regard, the trend is from mo-

nocular to binocular brightness.

Here again it is important to describe the two extremes of dull and bright. The dull phase is more of a brick color than a fade-out. In early infancy when the retinoscopic reflex would dull, it was as if the scope light had been turned off. Now a glow is present, but it is very different than the bright phase. This latter is a sharp, pink, lustrous brightness, and it comes up to bright as though you might have boosted the rheostat, or struck a match. It was our early observations in this stage that gave us the term "firing of the reflex."

This stage has a characteristic that makes observers feel that the young child is much more visual than he was in stages 1 and 2. As mentioned above, the previous stages seemed more biologic in nature -- as though it were all related to the gross mass action of the child. Now the baby seems to have found that he has eyes which will serve him. This is more of a physiologic performance stage - eyes are beginning to function at his command.

Stage 4. This stage is the level where monocularity and bi-ocularity have been completed in the visceral mechanism of the eyes as the foundations for accommodative binocularity. Now we see the training of eyes with our retinoscope just as we saw teaming on the dangled bell. We have called this the rightleft stage to indicate the unity of the two visceral systems. The child has learned to bring both eyes into action as a unit, and what one does, the other will do also.

The retinoscopic reflexes seen here are usually stable and consistent in brightness - if the previous stages have been adequately experienced by the child. The reflex is pink and alive in nature, and now holds its color even if fixation changes. Now, also, a dioptric neutrality can be obtained with more certainty while a child attends to the object of regard.

If the sequence occurs in an expected manner, this stability of reflex brightness is usually established by the time a child is 6 to 8 months old. The comments about the effect of illness or accident on the total effectiveness of the skeletal visual system unity, which appeared in the December paper, could be repeated here also about the visceral system.

Febril illnesses seem to have much more effect upon the visceral system, and early severe illnesses must be carefully noted on children's records. The interweaving of skeletal and visceral processes can be upset in these early months of a child's life because of the instability of either system. It is not the delicateness of the systems which makes them so susceptible to a high fever. It is the time at which severe illness occurs that results in deviations in the developmental sequence. Severe illness during stage 1 can result in either extreme hyperopia or myopia. If the child is in stage 2, a prolonged fever can result in a full amblyopia ex anopsia. If the child has achieved stage 3, an illness can result in the frequently seen high plus convergent squint which usually shows up at about the age of 3 years.

A number of children have been observed whose developmental case history showed extreme illness before the age of 1 year. These were all hyperopic convergent squinters. Usually our children receive the care and drugs which prevent these high prolonged fevers, and more squinters who show low hyperopia or myopia are now being seen. These children are more difficult to care for, because these cases must be approached more through the skeletal system, and early lenses do not have the effectiveness we so often expect. (There will be further discussion of lens application later in this series.)

It is important to realize that if a child achieves stage 4, the skeletal-visceral integration is rather well established and, as a rule, the illness must be very severe before its effects are significant to the further development of visual abilities.

While discussing stage 2 in this paper, we stated that the distance aspects of the reflex brightening would be given further consideration. As implied earlier, the observations of reflex brightening are all made at near-point in the infant. The manner in which a child builds his gross visual space world from self outward can easily and beautifully be delineated through retinoscopic observations. The four stages occur first at near distances, and recurs at varying distances as the child gets older.

Perhaps the following diagrammatic table illustrates the foregoing.

AGE	NEAR SPACE	MID SPACE	FAR SPACE
Birth to 1 mo.	Occasional, random brightening	Dull gray	No reflex
1 mo. to 2 mo.	Right or left bright	Occasional, random brightening	Dull gray
2 mo. to 4 mo.	Right and left bright	Right or left bright	Occasional, random brightening
4 mo. to 6 mo.	Rightleft bright	Right and left bright	Right or left brig
6 mo. to 10 mo.	Rightleft bright (can now be approximately neutralized)	Rightleft bright	Right and left bri
10 mo. to 14 mo.	Rightleft bright (can be neutralized with trial lenses)	Rightleft bright (can now be approximately neutralized)	Rightleft bright
14 mo. to 18 mo.	Rightleft bright (can now be neutralized with trial lenses at all distances)	Rightleft bright	Rightleft bright

The teaming of the two visceral systems progresses from a monocular phase through a phase of bi-ocularity to the expected binocular phase. Our observations prove, to us at least, that the child does not suddenly arrive at a full-blown binocularity of these systems. He must acquire it in each space area with practice and experience in each area. This is significant to us for two major reasons: 1) we can now understand how a child acquires a visual appreciation of space, and 2) we can now know what activities a child must have in each space area to gain this visual appreciation of the continuity of space for visual achievement.

There is a further aspect of this sequence that is very difficult to diagram. We have illustrated it with the arrow lines in the diagram. This is the Z axis integration that goes on throughout the process. The child does not simply move out into a new area of visual space, and on from there. He constantly backtracks to start over, and he is constantly going back to relate the new visual areas to the old ones with which he is familiar. This has been a difficult aspect of visual development to express and we have frequently been asked how we know this to be true. In fact we have even been accuse of "mind reading" and of assuming too much from our observations.

Nevertheless, we are convinced, for a number of reasons, that this ebb and flow of progress through visual space does occu a) It is apparent in all other behaviors, so we may quite safely assume that such a general pattern of progression is true in visual development, too. b) This sequence of visual space organization from near space through to far space has been observed in every test procedure used. It was very apparent in our observations of the young child in the stereoscope, and this will be discussed at length in a later paper. c) The further observations of the child from age 2 to 4 or 4 1/2 years of age, as he explores and develops visual appreciation of sectors of space, gave us many indications of this ebb and flow sequence.

This paper has not placed particular emphasis on the reach, grasp and release processed that are constantly occuring in

every stage. We feel that these processes are fully implied in our discussion here, but a brief review of each process may assist us in completing the picture of visual development in the first 12 to 36 months of a child's life.

We can describe the first stage of brightening as a reach, and the dulling as a release. In Stage 1 there is very little of the grasp process in action. In Stage 2, when an observer can obtain a neutrality, the grasp process is more stable, but not yet established. In this stage, also, the dulling to a brick red glow is a release to a degree of readiness for the next reach. In Stage 1, the dulling to a gray reflex is a release, almost to inactivity, like a completion of the visual act as though there was nothing to follow. Stage 3 shows all three processes as though they were related to each other and to the visual activity of the moment. Stage 4 shows the refinements of these processes, so the visceral system is ready to act with the skeletal system as gross ranges of latitude between the systems are being built. In this stage, release takes on a new purpose for system protection. Perhaps this progress from Stage 3 to Stage 4 is also the developmental process for retinal alternation which becomes so important later.

We have briefly mentioned the sectors of visual space that a child must learn to manipulate. This will be the material presented in the next paper. Before we close this one, however, it seems very important to re-emphasize that the process of binocularity is long and very involved. Binocularity is much more than macular fusion and foveal matching. It is actually an end product of all the stages and processes we have considered up until now, plus the many more we will discuss as we continue this series. We have used the term binocularity in describing performance and behavior in the young child because we wish to indicate the teaming of eyes as a unit. In our concept of visual development, the ultimate in binocularity is not achieved by the child until many more visual processes and behaviors are interwoven and integrated. Therefore, our next paper will continue under the title used for this one.

VOLUME 30 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE DEVELOPMENT OF BINOCULARITY
Part II

May - 1958 Series 2 No. 8

Last month we described and discussed the retinoscopic observations of visual development from near space, through mid space, to far space, and the four stages of ocularity. In closing last month's paper we commented on the sectors of visual space that a child must learn to manipulate if he is to achieve the full-blown binocularity which we have too frequently assumed is present in all patients. These assumptions regarding the adequacy of binocularity are more interesting as we begin to recognize more of the aspects and factors of visual development which must be achieved by the young child before the fullest unity of two eyes can result. The final paragraph of the last paper states our conviction that binocularity is much more than foveal matching and macular fusion.

There are thousands of pages in the literature on vision devoted to the manner in which foveal matching provides the cyclopean eye. Nearly all of this literature discusses teaming of the two eyes as if this foveal matching was the whole story of binocularity. Peripheral vision and para-macular fusion were usually considered as secondary processes for the recognition of peripheral motion and depth perception, and although these were recognized as important factors in visual performance, many authors still discussed binocularity as being complete at the fovea. Disparate points outside the foveal area of the two eyes were credited as the clues for depth perception, and thus according to many authors, a one-eyed person had no depth perception except by judgments of the movements of the target. or movements of the eye. It is only in recent years that presentations by researchers at conferences and seminars have shown these non-optometric audiences that a one-eyed person can have depth perception.

From a clinical vantage point we in optometry have long known that one-eyed people can and do achieve very adequate and reliable depth discriminations. Your authors have not found it, but we are sure that somewhere in the book stacks there is a discussion of how a one-eyed person achieves stereopsis without disparity on the basis of size constancy, or perhaps from distance judgments alone. It seems quite natural, then, that every investigator will turn sooner or later to space perception to find an answer. So we began to search the literature on this subject - and what a search! The biggest argument here concerns whether or not perception of space is purely innate, purely mechanistic, or the result of association and repetition.

As early as 1640, Descartes discussed space perception as both mechanistic and innate. He believed that innate ideas of space, time, and motion came to the mind with such certainty and inevitability that their acceptance is assured. To him, innate ideas were not derived from experience at all.

Hering (1834-1918) was a proponent of nativism in theories of visual space perception, and argued that each retinal point is endowed with local structural signs for height, width and depth.

Hemholtz (1821-1894) was an empiricist and felt that space perception is a result of experience. His approach was that of the genesis of the mind through individual experience.

Those of us in optometry who have had the privileges of the two weeks each June at Ohio State with Professor Samuel Renshaw, have come to know something about the work of Wertheimer, Kohler and Koffka and their contributions to Gestalt Psychology. There are many others who have approached the

problem of visual space perception, and their contributions are also important. Actually, as nearly as we can tell by our search, they generally aligned themselves either with the nativists or the empiricists. Theories and research evidences pile up, and all conclusions seem to be reached on the adult first, and second, with no observations of the primary mechanism for space perception, the eye and its behavior. All of those, from Descartes in 1640, until Wertheimer, Kohler and Koffka in our present day, drew their conclusions from subjective reports of their observers. Since none of these - to our knowledge at least - were able to view the actual processes of the development of visual space appreciation in the young child, it seems appropriate to put our meager philosophies into this attempt to understand how an appreciation of visual space comes about.

We are deeply convinced that the observations of young children, using the retinoscope as our tool, have given us in optometry, rare insight into space perception and the manner in which a child learns to manipulate the sectors of visual space. During the time we were watching children, we were also becoming acquainted with Dr. D. B. Harmon and his concepts of body and spatial coordinates. His concepts of the Y and Z coordinates, and the retinoscope observations we made, provided us with a framework upon which we could at least build a model of the processes of space perception.

We know from all observations and study that learning courses from the general to the specific, and back to the general. The four stages of oculo-skeletal behavior, and the four comparable stages of oculo-visceral behavior already detailed in this series, seem to us to be the basic generalities of learning to control the ocular mechanism on the Z axis. This sequence of development teams the two halves of the organism and establishes the unity of matched or reciprocal pairs. In the ocular mechanism this process brings extra-ocular muscles into coordination, and the intrinsic muscles of accommodation are readied for more specific performance. As the Z axis abilities are established, the gross general space appreciations and interpretations are acquired by the child. These we saw in the brightening of the retinoscopic reflexes at areas of space in front of the child. During these stages of visual development the retinoscopic reflex was characteristically a spherical reflex. It was also a variable reflex - as though visceral grasp ability was present - but not fully competent.

As we continued our observations of these youngsters, we were suddenly aware that some of them were beginning to pay visual attention to more than the projected target. Some of them were shifting their attention from the projection screen to Miss Bullis at the projector even while they were identifying and discussing the line drawing being shown to them. We repeatedly observed these children because we were seeing the retinoscopic reflexes change as we watched them, from spherical to a reflex that was "astigmatic" in character. We had also begun to see the shifting of the reflex from "with," to "neutral," to "against" and back to a "with" motion. We had already analyzed these changes in refractive status as visual shifts in space interpretation, on the basis that "with" motion represented a "focusing" beyond the target; "neutral" motion was representative of "focusing" on the target (complete conjugation); and "against" motion was representative of "focusing" nearer than the target.

About this time, we also came to realize that we observed the "with" motions when the child easily and quickly identified the target, and the "against" motion appeared when the child had to ponder and think about his identification. Since this could be repeatedly observed, and since we could so choose the target to bring about this "against," we concluded that when the reflex went into an "against" motion, the child was searching for meaning. This response was noted so consistently that we spent many hours making observations of this particular performance, and such scrutiny prepared us for the changes in the retinoscopic reflexes that had the "astigmatic" characteristics. We compiled more and more notes on each child as he became older, and as we studied other children in each age grouping, we realized that what we were recording as a reflex with a cylindrical component was both transient and sequential.

The analysis of our data on all the children under study showed us the recapitulation of the near space to far space sequence. This cylindrical component, which we now called a meridional difference, was first evident in near areas. At first, there would be a scissors motion, then it would usually settle to a meridional difference which we would record as "minus cylinder axis 90 indicated." This difference in meridians would be present as long as the child was intent upon the target. Characteristically we would see the horizontal meridian in "against" and the vertical meridian in "fast with" or "neutral." The retinoscopic reflexes at middle and far distances retained their spherical appearance.

Our confusion and discomfort can undoubtedly be imagined by any reader who was trained, as we were, to recognize such measurements as refractive errors. We spent many hours over these notes and concluded: 1) "against" motion of the retinoscopic reflex was usually observed while the child was searching for meaning; 2) the retinoscopic reflex changed to "with" or "neutral" when the target was easily interpreted; 3) meridional differences occurred at the same time we could see the child attempting to visually attend to, or visually encompass, more than the simple target at hand. We felt we were seeing a purposeful and dynamic sector performance - a reach toward more of space, as if the child was able to interpret the task, but was reaching to visually incorporate the object and area immediately horizontal to the task.

We then made extensive observations of general play and found these children occupying themselves in horizontal activities such as building trains, and running toy cars on the sand box roads. He was in horizontal action, manipulating and exploring every available aspect of it within arm's reach.

After a short period of time, these children would then show us a stage of "minus cylinder axis 180." The same observations of general play (now climbing and building towers) and our interpretation of the "against" retinoscopic reflex, brought us to the conclusion that these children were now visually reaching to build in the visual space immediately vertical to the task.

These meridional differences disappeared when the child became more competent in near tasks, and the retinoscopic reflex would become brighter, more stable and more consistently spherical in nature. Thus we saw a sequence and the transiency of these differences.

We then returned to earlier methods of observation to elicit the child's visual attention in mid and far spatial areas. The same meridional differences were apparent at these distances. Mid space was sectored, explored and reconstructed, and again the retinoscopic reflex became spherical with brightness and stability. Then, finally, the far spatial areas were processed by the child, sectored vertically and horizontally, explored and reconstructed, and the reflex once more became spherical, bright and stable.

It is our opinion that this is the process by which a child builds a visual space for himself. Each area, and each major meridian of the area are visually inspected and manipulated. Here again we saw the reach, grasp and release processes, more specifically related to the viscero-ocular mechanism. The scissors effect we observed could be the stage of reaching - actually of groping for the differences that exist in physical space. The meridional differences we could see with the retinoscope, were the grasp on a primary sector of visual space, and the magnitude of grasp demonstrated by each child was evidenced by the meridional shifts into "against" motion. When the retinoscopic reflex returned to its spherical nature, release of specific sectors had occurred, and the entire visual mechanism was ready for the next reach toward binocularity.

All of the above has been much more significant to our interpretations of visual development, and visual performance, than these few short paragraphs can imply. It took us many months to clear our old structural refractive error thinking to the functional, refractive status thinking necessary for any interpretation of the visual behavior we had been seeing. We turned to these observations frequently, and watched visual performance at all ages in our search for verification of our con-

clusions. We had now seen the processes of teaming in the skeletal system as the young child learned to control both mobility and immobility of two eyes. Out of this process came his skills of pursuit and fixation. "The visual system seeks and holds an 'image'," says Gesell. Next we saw the processes of teaming in the visceral system as the child learned to control the accommodative function of two eyes for the distances of space. "The visceral system discriminates and defines an image," says Gesell. Finally we saw the processes of visceral refinement as the child explored the X and Y coordinates of space and then interwove and integrated them to complete his individually unique visual space world.

Was all of this typical only of children? Were these processes of innate, mechanism growth changes, or had we observed the methods by which a child learns to see? If these were the processes of learning, and the stages of development through practice and experience, then we should be able to find children, who because they did not complete each stage, would therefore demonstrate deviate behaviors. Further, it seemed safe to assume that these same processes should be present at any age, if learning to see was required.

In a very short time we had a verification of the latter assumption. A patient, age 81, who had just had bilateral cataract surgery, came for lenses. Because of the circumstances of surgery, she was given one prescription lens and one occluder lens and kept under frequent and careful observation. Here was the very patient we wished for! Less than 20/80 before surgery, and now after surgery, she had to learn to see all over again. This patient demonstrated every single stage of each process that we had been observing in children. We watched her develop the binocular visual abilities we have been discussing in this series, and she was able to give us excellent reports regarding her awareness of each stage. We have also seen some of the same sequence in other post-cataract patients when they have had surgery on the second eye. If these stages of visual development occur in adults just as they do in young children, it seems to us this is conclusive evidence that it is a learning process rather than a mere growth pattern. Furthe[r]more, if visual space perception were innate, there would have been complete full blown binocularity in the post cataract patients the moment the lenses were applie[d].

As stated above, we have watched many, man[y] children in the years since the original study at the Clinic of Child Development in our attempts to understand the deviate or incomplete visual development. We are now confident that most squints and amblyopias result from incomplete teaming in the skeletal-visceral systems. But are most cases of astigmatism in children an incompletion of the processes of space sectoring described in this paper? This certainly appears to be the case, because here, also, we have been able to watch the development of the problem in some childre[n] and we have also had the opportunities to clinically assist children to complete these processes with lenses and training before the astigmatism was structured into a refractive error.

Many readers of this series will recall the Congress lectures on Carol - the preschool child with meridional differences which varied from 2.25 to 4.00 diopters. This child was cared for by standard basic visual training routines to gain motility and teaming, and with plus sphere lenses. Carol is in Junior High School now, wearing plus 1.00 D. cylinders with normal acuities at all points and honor roll achievement levels. Undoubtedly some of the astigmia seen here at the age of four was already a part of the ocular structure yet one cannot help but wonder what astigmatic correction she would be wearing now if developmental concepts had not been applied.

There are other developmental astigmias which we feel are significant to our clinical understanding. One of these is the frequently seen low amount of "astigmatism" seen in children after they start school. We have had the privilege of watching and guiding many children from the ages of 3 and 4 years into the school years. Most of these children showed no meridional differences with retinoscope or ophthalmometer during the preschool years. As the visual task of the classroom was met, the retinoscope showed us

a characteristic pattern of some minus cylinder at axis 180. As a rule, this was found on #4 (far point retinoscope) but not on #5 (near point retinoscope). We have already found, as so many other optometrists have, that a simple sphere prescription for all school work, given empirically in such cases, altered visual performance so the cylinder component was not observable on progress case study. We also discovered, the hard way, that if we found some minus cylinder axis 90, the same empirical application of plus for near did not reduce the "astigmatism" - in fact some cases progressed to more cylinder by the next appointment. These were the children who showed us more cylinder on #5 than on #4.

In thinking this through, we returned to our original theories of space sectoring seen in the younger children. We also gave attention to the characteristic against the rule astigmias which develop so frequently in senility. Careful study of case records gave us clues which we felt were valid. Our reasoning went thus:

1) The meridional differences seen in the young child correlated with his general behavior. When he was most concerned with flat surfaces and horizontal play, we saw minus at axis 180. Spatial distances are most constant in this type of play, and we felt there was primary demand upon the visceral system for discrimination and definition. When he was most active in building towers and climbing (vertical play), we saw minus at axis 90. Spatial distances were most variable in this type of play, and we felt there was now primary demand upon the skeletal system for seeking and holding. Therefore, minus with axis at 180 indicated visceral stress, and conversely, minus with axis at 90 indicated skeletal stress.

2) The meridional differences seen in the school child were minus with axis at 180 in the great majority of cases. The visual task of the classroom primarily involved the flat surface of the desk, reader, and workbook. Furthermore, skeletal teaming, as a rule, is more adequately established by the preschool freedoms and motor activities than is visceral teaming. Thus, the greater stress is upon the visceral system, and plus lenses are effective to relieve the stress of this task.

If the meridional difference was minus with axis at 90, and if the stress was in skeletal system, there would not be the same plus acceptance, and so plus lenses were not as effective in relieving the stress.

3) The characteristic minus with axis at 90 in senility was usually accompanied by a reduction of plus acceptance. These cases usually showed increased exophorias, and reduced ranges in prism base out in the duction findings. Stress in the skeletal system was apparent in the visual system, and in the total motor systems.

In summarizing our conclusions out of this reasoning, we have now come to the decision that with the rule astigmias are visceral in origin, and against the rule astigmias are skeletal in origin. Thus we feel that all astigmias are the result of inadequate or incomplete development in these systems so essential to complete binocularity. If such is the case, and we are deeply convinced that these are sound conclusions, then it seems reasonable to conclude that:

1) Skeletal teaming, with all of the processes of reach, grasp and release must be fully acquired as a foundation for biocularity. Basic motor development, both totally and ocularly, is demanded to establish this foundation which permits the visual mechanism to seek and hold an "image" in space.

2) Visceral teaming, with all of its processes of reach, grasp and release must be fully acquired as a foundation for binocularity. Basic motor development and basic integrative development, both totally and ocularly, are demanded to establish this foundation which permits the visual mechanism to seek and hold, discriminate and define an "image" in space.

3) Skeletal-visceral teaming, and spatial sectoring, with all of the involved processes of reach, grasp and release, must be acquired as a foundation for space perception. The interrelated processes of visual centering, visual identification, visual-tactual experience, and the movements of the total organism through space to verify experience, and to develop the

self-space continuum, are all required to establish a visual space soild. As this is individually developed and learned, the visual mechanism can then proceed to build the latitudes and ranges of performance which we can measure as fusion, depth perception, acuities, size constancies, form fields and all the characteristics we lump into the term binocularity.

It might seem to some readers that this discussion has gone far afield from the retinoscope and its use in clinical practice. Your authors feel that the developmental processes which give us a reason to use a retinoscope must be probed and explored if we are to know what the retinoscope tells us.

If the visual behavior which leads to space perception is innate, as Hering held it to be, then all a retinoscope can do is measure a refractive error, our search and study has been useless, and you need not have spent time with this series of papers. If, on the other hand, Helmholtz was correct in believing that experience and learning lead to space perception, then a retinoscope becomes a valuable tool for the observation of the refractive status which indicates those aspects of the visual processes being developed at the moment.

One cannot help but wonder what such men as Helmholtz might have "discovered" if they had been optometrists with a functional background, that would have released them from the concept that the eye is a camera, complete at birth; or if they had been given the opportunity to watch children during the early years of life; or, if someone had handed them a retinoscope with instructions to watch and see, then theorize.

Our questions were not entirely answered by the dangled bell and the retinoscope. Miss Bullis was intrigued for several years by the observable performance of nursery school children in the stereoscope. She noted behavior here that was significant to her other observations of general and visual behaviors. The stereoscope came into our explorations with children, and here we found further evidence of the sequence of visual space development and the resulting binocularity. This we shall present in the next paper.

VOLUME 30 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE DEVELOPMENT OF BINOCULARITY
Part III

June - 1958

Series 2 No. 9

The simple stereoscope is an optical device that has intrigued many investigators of vision for many years. So far as we can determine, no one made serious use of it for observations of young children. Or, if they did have a youngster use a stereoscope, the answers obtained were "vague and unreliable." So, as usual, in the bulk of the literature on children, if the child failed the test situation, the child was blamed because he was "immature," or "lacked understanding." There was no consideration of the fact that perhaps the test, as used for pass or fail answers, was invalid for a very young child.

The old and prevalent idea that we arrive in this world with sight and therefore should see, constantly interferes with most observations made of children's visual abilities in any instrument. This concept was firmly established on the philosophy that the eye is a camera and such cameras should work anywhere, anytime. If the camera did not get the picture, then the camera was at fault.

The stereoscope, like every other subjective instrument, presented a pass-or-fail test situation under this philosophy and concept. Not until Miss Glenna Bullis looked at the child as a growing, developing totality, who had to learn that the stereoscope was a trick representation of real space, did we get any answers to our optometric questions related to the stereoscope. Granted, we in optometry wondered why this instrument was difficult for children, but we usually blamed it on the difference between the child's pupillary distance and the P.D. of the stereoscope. Many of us wished for an instrument with a narrow P.D. just for children, not realizing at the time that the narrowing of the apertures would make no real difference in the responses of children who looked into it.

As previously stated in this series, for some time Miss Bullis had been observing children as they looked at stereo cards with pictures of interest to them. Her earliest interest was aroused because she felt there was some relationship between children's reading readinesses and their behavior in a stereoscope. She was not able to pin it down, but she knew there was a certain correlation somewhere if it could be determined. Therefore, as we made our original study of visual development, the stereoscope was included in our testing sequences.

The card depicting a little girl was used on one side, and a blank sheet of paper was placed on the other side of the stage. The children were asked to touch a "dirty spot on the little girl's nose" with a finger. If there was a delay in their response, they were then asked: "Where is the little girl?" or "Where is the doll?" These questions usually brought a pointing response by the children, and their localization of the picture, as indicated by where they pointed, was carefully noted.

There was one very significant aspect of this test procedure worthy of special comment here. Miss Bullis had already noted that young children were reluctant to sit in a chair and place the face in a stereoscope. Therefore, we arranged the test situation so the children could walk up to the stereoscope and stand before it while they peeked in. This arrangement allowed each child more freedom, and certainly it gave us better responses to observe. Today, more and more visual training is being done while the patient stands, rather than being restricted to a chair. Most optometrists are reporting more satisfactory results.

As we have looked back to our study of visual development at the original Clinic

of Child Development, we have frequently commented that we would not have been able to make the stereoscopic tests, had we insisted that a child sit down at the instrument. We can now understand that children - and adults - will perform in spatial orientation procedures more freely, and more adequately, when we allow them to assume a postural position more closely related to gravitational and egocentric spatial orientation.

Our observations of the children, ages 21 to 48 months, are recorded in VISION, Its Development in Infant and Child.(1) Since this book is now out of print and no longer available, a review of these observations is in order here.

At 21 months of age, the children had difficulty adjusting to the stereoscope and would usually take a quick peek, but turn away from the instrument frequently. We had to cajole and coax some of the more reluctant ones to look in, but on successive visits to Miss Bullis' office, these children would become interested and want to see what the picture was. When the children of this age would place their heads into position, they would hold onto the sides of the lens wells. They might identify the picture, but they were usually very silent. When asked to touch the picture, these children would move a hand forward at the sides of the lens wells, but would not release their grip on the headpiece. They would indicate that the picture was somewhere ahead of them, but there was no actual localization of the target.

At 24 months of age, the children were more interested in the stereoscope and some would spontaneously stand before the instrument, peer in and study the picture. When they were asked to touch the picture, these children moved arms simultaneously, then usually one hand would go on to the surface of the picture in a groping, or slapping manner. These children would reach with right or left hand, or sometimes with both hands, whether the picture was before the right or the left eye. They would then look over the top of the lens wells for the picture, then return to the instrument to try to locate the picture through the eyepieces. They recognized that the picture was away from them, and some of them explored as if to find out why it looked different over, or through the lenses. They certainly seemed to know it was somewhere in the space ahead of them, but they were not sure just where it was.

At 30 months they were more confident and more willing to approach the stereoscope. Their initial pointing response was with the hand opposite to the side on which the picture was placed. When asked to point at the picture, these children pointed into their own eyes, or into the lenses, or responded with a vague "that-a-way," pointing at the side of the lens wells. By this age the children were definitely aware that the picture was inside the instrument, and their spontaneous response was to relate it to their own eye or the first lens surface. When the hand was postured in the midspace between the lens wells and the target surface, by the examiner, the children would frequently follow through and place the whole hand on the picture. They would push on it as though trying to move it away - perhaps to push it into the position of distance where it appeared it should be through the lenses. They manipulated the target a lot, and would even jerk it off the stage, as if there was something incomplete or confusing about the situation. On retrial, they would again point into the lenses, but with the examiner's hand posturing clue, could get the hand out to the picture surface and would then use the index finger to point "at the dirty spot on the little girl's nose."

If the examiners asked the children to differentiate parts of the picture, the children became confused and would ask, "Where is it?" It seemed that the children could master one detail of the picture, and locate it, but if they were requested to see the entire picture, they lost all orientation of it, and to it.

After the initial response, the children would use either hand regardless of which side of the stage the picture was on.

At 36 months of age, the children would still use either hand, but were more apt to point at the side where the picture was placed. There was more verbal response at this age, and the children would say: "She's right there," or "She's inside over there," and point into the lenses.

At this age we observed more probing and spontaneous exploration of the stereoscope. These children, aware that this was some sort of a space trick, would bring hand out of lens well, go to outside of lenses, then to the middle space between lenses and stage, then to picture and back up to the back lens surface. During this hand exploration, they might withdraw from the stereoscope to look around the instrument, but would then return to look through the eyepieces. If they were allowed to see the picture from outside the headpiece, they would frequently report "two girls" and would say something about the one on the stage and the one on the lenses.

Now the touching on the side of the picture was more accurate. When pointing with the other hand to the blank sheet of paper (as in standard monocular projection technique), they would place hands in the vicinity of the center of the sheet in a searching manner, or would reach under and beyond the stage, and would then cross over to the actual picture. This was the most exciting period in our observations and as we watched the child grope and probe, we knew he was now approaching some mastery of the stereoscope as a device that simulates a binocular visual space situation.

At 42 months of age, the children illustrated the well-known cycle of development. First analysis of their performance indicated they were not coping with the instrument demands as well as they did six months earlier. However, very careful study of the records showed us that the children were much more critical and realized there were many questions being asked of them by the stereoscope. They were trying to organize and integrate all aspects of this situation, and their responses were more all-inclusive, but less accurate. What appeared to be less adequate performance on first glance at the records, was actually the "back side of the cycle" when the child is less rigid in performance so he can take in more information. Here was an example of Ittleson's and Cantrill's "unlearning," or the release of rigid patterns to allow the growth and extension of the many related patterns. (2)

Now the children would use either hand, persistently starting their localization on the inside or outside of the lenses, then usually getting into the midspace area, and then proceeding to the surface of the picture. When they did complete the sequence, their pointing was inaccurate, and they pointed at an area without really locating the details of the picture.

If the children hesitated while reaching for the picture, the hand would drift in close to the septum and might cross over to the other side, so they were touching the picture instead of its projected image on the blank sheet. They might reach clear out to the top of the easel which supported the stereoscope stage, or even way down under the easel in their attempts to touch the picture where it appeared to be. We definitely felt this was our first evidence that the children were now beginning to visually interpret the apparent distance of the picture on the stage.

Their remarks were also typical of their visual behavior. They would comment: "I can't touch it - it's way over there"; or "It's in here" while pointing into the lens; or "It's way down there - How can we get it? - We can't."

At 48 months of age the youngsters would first identify the picture and locate it by pointing first into the lens, then around to the back end of the lens wells, and then, slowly and unsteadily, they would reach toward the picture until the surface was touched.

Although these observations were made ten years ago, the behavior and performances seen are still vivid in our memories. We can still close our eyes and see these children working their way through the stereoscope as they discovered by their explorations that the target pictures actually looked far away. At 48 months we could observe actual projection within the test demands, and the children's success on the test was evidence to us that they were seeing the entire picture in a new spatial position and relationship.

We can now recapitulate these original observations in line with the context of this series of papers (especially papers Number 7, 8, and 9 on the Development of Binocularity) as we see the young child

building his own binocular visual space world. Our interpretation of this sequence of behavior in the stereoscope can be criticized on the basis of the same statements made in the opening paragraph of this paper. Certainly, the children were too immature for this test sequence - if we desired pass or fail answers. Since we wanted information on how children behaved in a test at different ages, and at different levels of development, this test was just as valid as any situation which demanded a response from the children, because it was presented to them at their level of ability without demanding adult discriminations or judgments.

As we study the six age levels summarized in this paper, we find the same monocular -- bi-ocular -- binocular trends, and the near to far development that we had been seeing in our other observations. At 21 and 24 months of age we saw the children in the monocular stages with indeterminant spatial distance judgments. At these ages the children slapped at the picture without accurate discriminations of where it was, except that it was out there somewhere. Their contact with picture, using either hand, nearly always touching the picture area, unaware of the blank sheet of paper, showed us a monocular performance.

At 30 months of age the children would explore the picture and the blank sheet as though they were using both eyes unteamed, but now aware of more in view than just the picture. This performance was similar to the bi-ocular stages observed elsewhere. Spatial distance judgments were inaccurate, but we could see the children attempting to locate the picture position, and when it was found, they would manipulate the picture with their hands as if by this manipulation they could determine just where it was. Although their spatial distance judgments were inaccurate, there certainly were responses giving evidence that the children saw the picture as something they could touch because it was in an area of near space.

At 36 months we saw the beginnings of the binocular stage, when the children would occasionally point to the blank sheet as they tried to touch the picture. Here was our first evidence that the children were projecting a left eye image onto the blank sheet, of the picture seen with the right eye, or vice versa. At this level of visual development, the teaming of eyes was adequate to meet some of the demands of the stereoscope, and the children's performance indicated they saw more than just what the one eye was telling them. Their hand movements from lens to midspace, to stage and picture surface -- then over and under the stage reaching beyond the picture was evidence to us that they were visually "interpreting and verifying" the spatial distances represented by the stereoscope. They knew this test situation represented something more than near space, that there was some mid space to traverse in touching the picture, but they did not know just exactly where it was in far space.

At 42 months to 48 months, the children were beginning to master the instrument, and we observed the stabilization of binocularity as they became more accurate in locating the projected image. The very fact that they would occasionally cross the septum and touch the picture, was evidence to us that eyes were teaming more adequately than before. This crossover would not have been possible in the monocular stage, when all attention was on the view that one eye provided. Now at least, the children were aware of both fields of view, even though the details of both fields were still difficult for them.

They now realized that their interpretation of spatial distances through the stereoscope were different than their judgments of the picture distance when they looked at the stage over the top of the headpiece. They were reluctant to attempt to touch the picture while looking through the lenses, and said so. They verbally expressed the differences they saw by saying there were two different pictures, and said they couldn't touch the picture because it was too far away. Here we had our evidence that the children were now interpreting far space.

Thus, we saw the entire sequence from monocularity to binocularity, and the progression of visual appreciation from near to far, repeated in simulated space (as in the stereoscope) just as we saw it with the retinoscope in real space (of the examining room). We observed the further

development of eye-hand coordination in a test situation where hand followed what eyes saw in the later ages, just as we observed it on other tests.

This entire sequence of observations of young children in their approach and mastery of the stereoscope should be re-done. We wish someone was in the position to review our observations of ten years ago - this time with instrumentation that would permit retinoscopic observations on children at each of these age levels. We are confident the same results would occur, but in using the retinoscope for verification of the children's performance, we would have some interesting and valuable data. In fact, we feel we could predict the responses that would be observed in each stage, and although we can now surmise that the lack of projective ability is a factor in reading readiness, these retinoscopic verifications might well prove the theories of correlation first outlined by Miss Bullis.

It seems we always come back to the retinoscope as the one instrument we can depend on for our observations of a patient's binocularity and spatial appreciation. Since it has become important to us in functional optometry, because it tells us so much about the entire visual mechanism, we shall give it further attention and discussion in the next paper. The technique originally called Book Retinoscope gave us further insight into the role that binocularity plays in meeting the demands and tasks of our world today. As we approach this discussion of binocular visual performance, we again ask that you realize there is more to binocularity than fusion and depth perception. Once more, we shall consider the reach, grasp and release aspects of the total skeletal-visceral oculomotor act. In preparation for this discussion, we would like for you to review and analyze the six levels of stereoscopic performance described in this paper and do a bit of mental analysis on what you think the reach, grasp and release sequences are in each level.

(1) "VISION, Its Development in Infant and Child," Gesell, Ilg, Bullis, Ilg, and Getman, 1949. Paul B. Hoeber Inc., New York.

(2) "Perception"; Ittleson & Cantrill. Papers in Psychology. Random House, 1954. New York.

VOLUME 30 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getmon, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

"BOOK RETINOSCOPE"
Part I

July - 1958 Series 2 No. 10

This paper will be a review of events and occurrences out of which came the technique generally known as Book Retinoscope. We have tried for several years to find a more suitable name for this procedure, because the response seen as an "against motion" is observable in so many situations. In presenting this review, we must cover the twelve years that we have been working with the technique, so a more detailed account can be given. This is very difficult because so much has happened and so many investigations have been made. The notes in the files, a study of records of experiments at Ohio State University, in the two weeks each summer spent with Professor Samuel Renshaw, and the reports from literally hundreds of optometrists using the technique, will all have to be summarized. Some of this account will be a repetition of paragraphs in previous papers in this series, but this is appropriate to a full presentation of this procedure.

The following paragraphs are an account by Dr. Getman of the development of the book retinoscope:

First we must go back to the Clinic of Child Development, the original Clinic at Yale University, where it was my privilege to participate in the original study of the visual development of young children. I went to Connecticut the first time with a very set idea of how small children should be examined, and soon realized that what I interpreted as "small children" in my office were not the same as the young children we observed there in the clinic. Having dealt with children of 5, 6 and 7 years of age, I thought I had the background to work with a preschool child, but it took only a few days in Connecticut to clear my thinking. I found that the routines I had used on children were not at all useful on children 2, 3 and 4 years of age; and so we had to devise testing methods at New Haven which would let us make observations, and do it in such a way that we could depend upon the answers we obtained.

I have written about our original approach, and how the retinoscope became the most important diagnostic and observational tool, because there was so little else we could do with the child aged 2 years. We found very soon that the visual abilities test (the original skills battery) gave us no information, and we found, of course, that we could not use a phoropter. We needed tests to fit the child rather than asking the child to fit our tests. This did more to clear the air, making early observations possible, than anything else that could have happened.

We must give Miss Glenna Bullis a very great deal of credit for the original steering; probably we should still have no information if it were not for her. I can remember when we first sat down to discuss the tests we would make. Every test I would suggest, she would very graciously and constructively criticize as too complex for the child. As we went through all the possibilities, we finally realized that we had to depend upon two or three very basic observations, which could be related to early visual development. As we devised methods of making retinoscopic observations, one of the very first things we had to eliminate was a working distance lens. This meant that if we were going to do retinoscopy, we must get the child's attention on a distant screen. We could not scope from 16, 18 or 20 inches and use a working distance lens to maintain our basic conjugation as is done in the standard No. 4 finding.

We carefully chose a series of 2 x 2 slides with simple line drawings which would ap-

peal to young children, and tried to pick the slides on the basis of the child's interest. Anytime I attempted to do a scoping in the standard manner, the child immediately shifted his attention from the picture on the screen to me and to the retinoscope, and we immediately lost any chance for a retinoscopic observation. By dimming the illumination a bit and moving off to a distant position with the retinoscope, we made our first observation.

This has been a point of contention over a period of years because some students, insisted that it was impossible to do a retinoscopy from 16 or 18 feet. I found, of course, that the problem was with the retinoscope they were using, which did not give enough illumination to cover the distance. Furthermore, a lack of experience with the retinoscope made it very difficult to find a reflex at that distance, especially so in a room where there was light on the subject's face. This, of course, got ironed out in time, through use of a different type of retinoscope which had more illumination latitude.

The above is significant because we first found the "against" motion even at 16 feet, and, of course, when it was first observed, we had a great deal of difficulty rationalizing this observation. Again I must give credit to Miss Bullis and to Dr. Vivienne Ilg. Dr. Ilg had done some work at the original Yale Clinic before I got there, and she had reported the observation of the "against" motion under certain circumstances. It took us some little time to realize what the circumstances were that produced this "against" motion reflex. The more we worked with it, the more we found that, regardless of the distance at which the child was looking, we saw this "against" motion any time there was recognition or special interest in the target being used. When we discovered this, we had a clue to the phenomenon and to the whole concept which has now developed over these past twelve years.

I can remember very well creeping along the floor in front of a child at different distances at 16 feet first of all (because this was the length of the room, not because it was optical infinity) to get as nearly in line with the target on the wall as I could, and still not have the light of the projector thrown into the retinoscope. I noted a brightening of the reflex when the child's line of sight was directed at the picture on the wall, and anytime the reflex brightened, I saw a reduction of "with" motion. When the reflex was dull, as though the child were merely "looking across the room," I would get a lot of "with" motion. Our early judgments were on the basis of "dull with," "bright plano" and "brighter against." The "dull with" occurred when the child just looked across the room; the reflex would brighten and come nearly to refractive plano when the child's attention fixed on some particular object or picture. When the child made some identification of the picture, we always saw the "against" motion - so we immediately assumed that the "against" motion had something to do with identification.

We then found that as we moved in to about 8 feet, with targets of various types, again we perceived this same sequence of brightening - the reflex approached refractive plano, or at least a definitely reduced "with" motion - then, when the child spoke, or in some fashion identified the target, we again observed the "against" motion. I remember so very well a particular child. When she was shown a line drawing of baby shoes, she did not speak nor shift eyes away from the screen, but lifted her foot and reached down to touch her own shoe. At that moment, the reflex shifted to a very definite "against," even though she was still looking across the room. This was one of the first youngsters who gave us an idea of what we had, so we pursued it very diligently.

The technique was called Book Retinoscope because the reflex was most easily observed and controlled while the children were studying and identifying pictures in a book. I remember very well the first attempts to rationalize and to understand this shift in the retinoscopic reflex. Our attempts to analyze it on the basis of straight physical optics were fruitless and we came up with absolutely no answer - as you can well imagine. Here was the retinoscope at the same plane as the book, and in optics we should have a definite conjugation. On some children we had a very definite amount of "against" motion, sometimes two or even three diopters.

Interestingly enough at this point, we found that when the child's attention was on the book and he made a verbal identification of the picture, we could use neutralizing lenses. Now we found that instead of the increased plus that should be present according to standard No. 5 finding, we had to use minus lenses for neutralization. However this "against" happened only when there was identification indicating an understanding or a comprehension of the picture. As a result of this observation, we associated the "against" motion with the child's ability to comprehend, to understand, to identify and to verbalize something about the target given him.

I recall one other youngster who gave us a clue. He was sitting in the examining chair which was backed up to a window. The child was interested in the picture thrown on the screen as the target when suddenly the fire engine with the siren making considerable noise went by outside the clinic. Before the child could turn and look out the window, I was aware of the definite "against" movement.

It now seems strange that some of these things stick in my memory so clearly. I was so deeply impressed with it at that particular time that it left certain mental pictures that come to mind anytime I think of the original clinic. I can see the little girl reach down to her shoe as if it were yesterday. I can see this little boy who was sitting there then the siren blasted as if it were this morning.

I do not know of any particular reason for finding this technique other than just circumstances as they evolved there at the Clinic. As previously stated, Dr. Vivienne Ilg found it first, made comment about it, but did not work with it as much as I did, so she did not come to the same conclusions until later when we had a chance to discuss it and make more observations. I want to pay her definite credit for having recorded it when she saw it, despite the fact that it fitted with nothing she gained in her optometric training. I think it would be quite the usual thing to ignore it and simply say, "I cannot see what I am looking for" - or some other comment, and pass it by, rather than make a good recording of the observation in spite of the fact that it didn't fit.

This early experience with these small children gave us much information, and the advantage at that time was the fact that we were working with children young enough and naive enough that the responses were quite pure. This, I think, is significant. We could not have found it on adults because, now that we know what to do with it, we know that we must set the stage a certain way or we still don't see it on adults. This is how we happened to find it in the first place.

I think it is important to realize that it came out of well-controlled experimental situations, where we were making observations on young children, under the guidance of Miss Bullis, who knew how to control the test situation, and how to gain the child's cooperation. Thus, her contribution to this whole concept is very great. I don't think I could ever have seen it in my own office, Miss Bullis would not have been there to set the stage so that we could get the full and complete cooperation of the child. It all came out of the conditions of the least possible distraction and greatest possible attention factor within the test circumstances.

This also describes a bit of its original use. We paid much attention to it in our study of the children at New Haven because it gave us very definite clues in our study of binocularity. As you know, we find the young child practicing to gain skillful use of first one eye and then the other, and then beginning to put them together as a pair, and finally gaining the unity of the pair. We were able to use it as a determinant of the stage in which the child was operating at a particular age or in a test situation, because we found that one eye would brighten and then both would brighten, then one would shift into "against," etc. We had already concluded that it indicated the comprehension of the test circumstance. We then concluded that the particular eye that was shifting into "against" was reacting more as a part of the <u>visual totality</u>. The original use, then, was based more on observations of the development of binocularity.

Later, it was at Ohio State University that we really began to experiment with

the phenomenon. I had reported it and emphasized it so much to Drs. A. M. Skeffington, George Crow and S. K. Lesser, that we began to use it on adults at Ohio State University to see what we could do with it. The development of the whole technique has actually been carried on more at Ohio State University than anywhere else. Of course, we have used it in the office and carried through there, but since this is a sequence of events and a sequence of developments, it is difficult to say that the routine, as a technique, got more impetus one place than another. At least at Ohio State University, we had the time and the circumstances, the equipment and the scientific methods by which we could isolate and develop the technique. It certainly had to be studied on adults. We had to control the circumstances even better than we did on children, and I think, now that we know more about the technique, this need for control is very understandable.

In 1947 we made some of our first observations with the retinoscope on adults. This was the year when we used subjects standing at the windows in the lecture room on the third floor at Arps Hall and had them look at the radio towers which were about a half-mile away. We asked them to follow the aerial wires between the two towers, and it was upon this instruction that we found the reflex would shift into "against." It is obvious that the wires stretching between the two towers at a distance of a half-mile are very small and should be quite invisible. Still, knowing that there was a wire there, and with a blue sky as a background, the wires could be seen by the subjects. On an acuity basis, I don't know exactly what visual acuity this would be - probably somewhere around 20/.05. The visual angle is not enough to see the wire, but nevertheless, it could be seen.

No matter on how many subjects we tried it, we found that when their attention was on the radio towers, we obtained a definite neutral with a certain working distance lens, but when they shifted to the aerial wire, they always shifted into "against." We studied this reflex shift on a number of people in this fashion. We also used the pseudoscopic view of the moon in the special stereoscope that Dr. Renshaw has where stereoscopic view can be changed to a pseudoscopic view without the subject being aware of the change. Every time the change was triggered in the stereoscope, we could see a shift to an "against" motion while the viewer reorganized to interpret the picture.

Here was a situation where there was absolutely no change in viewing distance, no shift of anything except the stereoscopic interpretation involved. Whenever the shift was made, the subject had to do some reorganizing in his own mind to comprehend and interpret the picture. While he was in the process of interpreting this stereo slide, the reflex shifted to a very definite "against."

In 1947 there were a couple of groups working on the retinoscope, where prism was introduced into a viewing situation. From this time on there were a lot of observations made of the various refractive factors, observable with the retinoscope.

The 1948 summer groups investigated a time lag in retinoscopic phenomena the base-out and base-in prisms on fixed figure groups, and crossed and uncrossed ground disparities, time lag in far-to-near and near-to-far, etc. We were trying by every possible means to analyze the situation which brought about this shift into "against."

In 1949 there was some work done with prismatic effects on the retinoscopic phenomena to see if changes in centering were part of this phenomenon. This work showed that, regardless of what we did, comprehension and understanding had to be present in spite of any lens or prismatic combination - if the "against" motion was to be induced.

In 1950 there were some investigations made on the depth of field in identification. This was one of the first years when the research equipment was used that brought the sense and nonsense sequences of letters out of blur without any change in size. And again, with the retinoscope, we could observe that regardless of blur, when the target was comprehended and interpreted, there was the shift into "against." Next, there were the color temperature effects on the phenomenon.

Many and varied ideas were tried: effect of flicker on the retinoscope finding while the subject was reading, the effect of the color temperatures and excessive lens, etc.

In 1951 the focal variator was used again to see what would happen when the degree of "clarity' was determined by the change in identification.

In 1952 there was a research group who made arrangements at the police station so we could use the Police Department's lie detector. We went to the station and made observations on some of their subjects to find out if we could tell with the retinoscope whether there might be a change in skin temperature. This was the year that we determined we could call the shift into 'against" as fast, or faster, than the lie detector would record the change in body chemistry. This was a very important step. We began to realize then that things were happening that were more related to the total organism than to just the optic mechanism.

The big year for the retinoscope was 1952. It was then we had a series of retinoscopic observations on children's perceptual responses to geometric forms. We determined that the child could be observed making an interpretive matching between geometric forms, strictly by watching the retinoscopic shift without a verbal response. Another group was working with changes observed on size matching judgments; another on changes observed with the subject on the focal variator, and the first experiments were rerun. Again, the lie detector sequence was redone, and the retinoscopic observations were related to several body responses. That year nearly every group worked on retinoscopic experiments.

It was an interesting year, because nearly everyone came up with the same conclusion. At that time we could definitely state that whenever there was a change in interpretive demand, or comprehension demand, on the part of the subject, we saw the "against" motion.

This was also the year I spent some time with Professor Ward Halstead at University of Chicago. Using some of his graduate students, we set up some experiments, one of which was strictly an auditory judgment where the subject had to make a decision relative to time sequence of the beep he received through earphones. Here, also, we could tell when the subject was comphehending this test situation on the basis of the retinoscopic reflex.

There was also a tactual test in which certain discriminations had to be made through the finger tips. Again, when the comprehension of the test allowed a decision, we saw the shift.

The year 1952 was rather important because we worked so hard setting up the equipment for perceptual responses to geometric forms. We built a very involved device where two observers could observe the child with the use of half silvered mirrors, and thus determine for certain that the change was taking place. The observers could watch both of the child's eyes, and also check each other. This was an important study because I made none of the observations myself. The observations were made entirely by people in my group who had to call the responses. Actually, we set up a key system so each observer pressed a key when the reflex shift was seen. Thus they could not agree with each other unless each observed the reflex change. On this paper tape we had records that both observers pressed their keys when the shift happened, and they consistently agreed in their observations.

In 1954 we used the retinoscope for observations of various three-dimensional situations. Here again we determined the same response of interpretation and comprehension which we had seen on the previous retinoscopic observations. It was at this time that Dr. Skeffington and his group worked so hard to get photographic recordings of the retinoscopic phenomenon. As you know, there are some fair films showing the shift into "against." They were not able to get colored films that were sensitive enough to record brightness and color shift, so this left much to be desired.

OPTOMETRIC EXTENSION PROGRAM · 1928

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

"BOOK RETINOSCOPE" Part II

August - 1958 Series 2 No. 11

The important developments have just come sequentially. There was no particular time when anything was done that was more significant than anything else. It all came over a period of about ten years with every kind of observation that we could dream up. We tried every conceivable way to investigate this shift into "against" to find out just what accounts for it - and we still have to assume certain things.

The story of Dr. Ward Halstead's experience is interesting. He was one of many who doubted, until we demonstrated it. Then there was agreement with us that it dealt with the interpretive magnitude of the task being met by the subject. Dr. Halstead was in the hotel room in Columbus for a nice, easy, relaxed session. Late in the evening, Dr. Skeffington asked him what he would say if told him we had an almost instantaneous test of comprehension. Being the very kind gentleman that he is, Dr. Halstead took about an hour to tell us very politely and very graciously, but very emphatically, that we were a bunch of screwballs. After he had run himself out of breath and kind words, Dr. Lesser asked him if he would like to see it, and he said he would.

We set up a situation whereby he could make the observations. It was about 1:00 or 2:00 o'clock in the morning when Dr. Crow went down into the lobby and picked up three fine young fellows who were a part of the St. Paul baseball team. How he ever got them up to the room is more than we know, but if you know Dr. Crow, you know that he can accomplish what he sets out to do. We used these three subjects to illustrate to Dr. Halstead that there was such a phenomenon.

We could just about tell Dr. Halstead how much these three young athletes read. I can remember working on these three. I judged that one would read only the comics in the newspaper; one only the sports page; and one read for fun. They agreed that these were their levels of reading. Thus, we had evidence of the usefulness of the technique to determine reading levels.

After we had finished observing the three young athletes, Dr. Halstead said he wanted to be the subject. We picked up a test on psychology, and he made his famous comment that the book we gave him (of very difficult material to us) was "bathroom library" material for him. He read it upside down and backwards, and I still could not report any "against" motion. He then said, "Tell me when you see 'against' motion, but I won't tell you what I am doing."

He started to read, and I could then report that he shifted into "against." We tried it again, and repeated it several times. Finally he threw the book on the floor with an exclamation and said that it was impossible, but that he was convinced, and that someone, somehow, would have to invent a whole new physiology to account for this phenomenon. When we asked him what he had been doing, he said that at the time he had been reading and translating this material into Greek, that this was a high intellectual demand for him; that the reason we couldn't get the "against" on the original material was because it was too simple.

We realized then that we had to set the stage very carefully at a level where there was a real comprehensive intellectual response on the part of the subject, or patient.

I could give many other little stories of its development, but I think these are sufficient. I can also remember going into Dr. Emmett A. Betts' Clinic in Philadelphia to check some of his pupils there

because we needed to know something about the shift related to known reading levels.

I think one of the reasons it has been difficult for some people to use it is that those of us who have carried it through from the beginning, saw changes in the reflex and recognized them. But, we neglected to pass these details on to others. We can now describe four stages in the retinoscopic reflex which relate to reading levels, or interpretative levels.

The first stage is the very brick-red, dull reflex, is nearly always accompanied by a lot of "with" motion. This is the nonreading stage, or complete frustration level. This we see on youngsters who are thrust into reading material far beyond their comprehension, and it is much like the No. 5 Analytical Examination finding. They just look at that particular distance; the reflex will neutralize at about the same plus as the No. 5, but there is no interpretation of the page.

The second level is the bright reflex, rather sharp, with a pinkish cast and is approximately plano, or perhaps +.50. This is the good reading level where the plano to +.50 bright reflex shows somewhat as an easy, free-reading situation. This is like a fifth grade student on fourth grade material - or reading familiar nursery rhymes. The reflex is bright variable, and there is some effort involved in maintaining comprehension.

The third stage (instructional level a la Betts) is where the subject will show around -.25 to -.75, and sometimes -.50 to -1.25; bright, sharp, reflex, very pink and very fluid. This is where he is really working to understand; coming up against tough words; really having to reach for meaning; where the higher "against" (the -1.25) shows on the tough words like "interurban" or "intercommunication," etc.; and the -.50 will be on the little words, the connective phrases, etc. The patient is putting everything he has into the job and really working to comprehend.

The fourth stage is that which we have neglected to discuss. It is the one where there is very little shift from the No. 5 finding; the reflex is very bright, very fluid, and will scope just about the same as a No. 5 finding. This differs from the first stage in that the first is a very dull reflex, brick red, and rather rigid. This reflex is a bright, sharp reflex, and indicates the patient's free reading level This is the stage that has been so difficult to understand. The reflex shows "with" motion, and the patient is comprehending the reading material with very little effort.

Stage 2 and Stage 4 of this phenomenon have been the difficult ones to differentiate. Stage 2 is plano to some plus and indicates an <u>effort to maintain</u> comprehension. Stage 4 is slightly less plus than No. 5 finding; the reflex is bright and stable and is like a fifth grader on first grade material, or a teenager on nursery rhymes, and indicates comprehension <u>without effort</u>.

These stages were described a bit differently in the book, VISION: Its Development In Infant and Child. The following are given here just as recorded in the book as further explanation of the phenomenon:

GRADIENTS OF REFLEX VISION: Pg. 183

A. DULL RED (brick)
   1. High <u>plus</u> (or <u>minus</u>)
   2. Low recognition, or awareness
   3. "Flop" period (neither good quantity nor good quality of "effector set")

B. BRIGHT PINK
   1. Low <u>minus</u>
   2. Higher recognition or awareness than A, but not "spatially on" point of regard, though interpretively "at" point of regard
   3. A quantity of set, but only of periodic or episodic quality

B1. DULL PINK
   1. Low <u>plus</u>
   2. Refractory period that follows B1 but not the "flop" of A
   3. First indications of quality development

C. WHITE PINK (bright and still pinkish, but not white)
   1. Plano
   2. Neither <u>plus</u> nor <u>minus</u>, because

the effector "set" is now approximating point of regard without the apparent movement "around" point of regard, as in B and B1
3. Better quality than ever before, but still with minute periodic refractory shifts

D. WHITE
1. Plus (+.50 D. or +.75 D.)
2. Higher-grade cortical control of C. In more constant and "effortless" control of total spatial loci, and more constant "set" for task
3. Now "set" with quality and consistency

It can be summarized by saying that we can determine the four stages by the two obvious ones - the dull, brick red "with" motion, which indicates no comprehension whatever; the opposite is the -.75 to -1.25 where the patient is working hard to dig out the information. Stage 2 and Stage 4 are quite similar, but can be differentiated with practice on the basis of whether or not the individual is working to comprehend. There are the three levels most observable to everyone - the frustration level where the subject is blocking and not reading, not even seeing the words; the instructional level where he is working and digging; then the free reading level, where the reflex is around plano, with good comprehension, and still a bright reflex. These are the important stages and can be used to discriminate reading abilities in almost anyone.

The secret, of course, which comes only with experience, is the ability to set the stage and demand of the patient the kind of comprehension that is necessary. One of the things that makes the difference is the instruction to the patient: "Read it carefully because I am going to question you afterward about what it said."

Of course, this technique has many implications. How to explain the phenomenon is another thing. We know it cannot be explained on the basis of bench optics; it is even less explainable than some of our other retinoscopic findings. If the retinoscope could be explained on the basis of bench optics, the retinoscope would not be necessary as a diagnostic instrument. The No. 5 finding could be determined from the No. 4 finding merely by computing the optical distances. We know this does not work.

An attempt has been made to explain it on the basis of body chemistry and shifts in the chemistry of the retina. This we cannot determine - we can only theorize. Warren S. McCulloch has tried it, Darell Boyd Harmon has tried it, and they have only theories. Right at the moment it seems that the best explanation lies within the cyberneticist's viewpoint of backstroke - something that comes back neurologically to the ocular mechanism out of the entire visual circuit which resets the sensitivity, or readapts, or readjusts the sensitivity - feedback, overflow, - or something!

The reason this seems most plausible, is because of the Jim Kibben investigation we made at Ohio State University three years ago. Jim Kibben is a man about forty-three years old, who has been sightless for about twelve years due to optic atrophy. He was a lucky find. We wanted him at Ohio State University very much, because we wanted him for observation. McCulloch at M.I.T., upon hearing about the retinoscopic observations, asked what would happen in the case of optic atrophy. Dr. Skeffington told him that if our theory assumptions were correct, we should get the retinoscopic shift even in a so-called 'blind' eye.

We made arrangements for Jim to travel to Ohio State University. He is a very capable individual, travels alone, even though he has absolutely no light perception following the complete degeneration of the optic nerve. Interestingly enough, the media are clear. He has a perfectly normal eyeball. We got the "against" motion on Jim whenever we set the stage for intellectual performance. We saw it, as we had in previous cases, when we asked him to make tactual decisions as to size, and shape, and texture. We saw it when we gave him mental arithmetic. We saw it when we had him make auditory discriminations, which indicated that there is much more of total organism in this thing called book retinoscope than mere focusing, refocusing, accommodation, or point focus on retina.

One rather famous scientist who was closely allied with two major laboratories of optic manufacturers failed to see the "against" motion. Dr. Paul Boeder was the subject. Dr. Boeder saw the "against" motion and described it. The other person did not see it, and merely said that, although he saw some change in reflex, he was sure it was nothing more than "better point focus on retina."

It is interesting that on Jim Kibben, where there was no need for "point focus on retina," we still got the "against" motion. We know that it is more than the crystalline lens, or the cornea, and whatever else accounts for accommodation. It seems it has to be the feedback from the rest of the system when everything is conducive to full comprehension.

This is the story of book retinoscope. I wish we had a better name for it, but some label has to be put on it. Somewhere, or sometime, we shall find a better term. There can be very little doubt that this phenomenon is a test of intellectual ability. It is now being used in so many different ways, all based on the premise that it is a test, or an observation, of a child's or adult's ability to make an intellectual decision relative to the material at hand.

It has been a most effective test on retarded children. Here it has come into its own more than anywhere else as far as prognosis is concerned. It has been found that, regardless of the diagnostic label put on a child (whether he is mongoloid, brain-injured, encephalitic, etc.), when the child is in a situation where this shift into "against" is observable, we know this is a situation out of which he gets some meaning. We find so frequently that the retarded child does not seem to associate hand activity with visual activity. There is no basic eye-hand coordination.

It is as though the eyes had no relationship to what the hands were doing. When the retarded child is put into certain tasks where he has developed some skill in tactual abilities, and our observations with the retinoscope show us the shift into "against," we can say, "Aha, here he knows what he is doing." Using this as our clue, we have set the training in a special school around this activity. We have found definite improvements in these children as a result. This seems most significant because an I.Q. test does not tell what a child can do. It merely tells where he might be capable at this moment on the tests of so-called intellectual development. It does not tell how he makes decisions, nor what decisions he can make, etc., but the retinoscope does.

These children look at a lot of words (and frequently call them correctly) but the reflex is a dull, brick red, "with" motion, we know they are not comprehending. When they are in hand activity (like blocks and pegs), and we see them perform with the observable evidence of knowing what they are doing, and we see "against" motion retinoscopically, we know training must start with eye-hand activity. Every time this has been done with these children and their training set accordingly, we have seen improvement. It is the retinoscope that has told us the child was comprehending what he was doing.

I am enthusiastic not alone because I have had the pleasure and the privilege of watching this thing develop over a period of years but because other people can use the test. We all know of people in the profession who have designed routines and techniques. Some have obtained spectacular results, but no one else could duplicate these results. Many, many optometrists are now using the book retinoscope technique effectively and diagnostically. This seems to evidence its validity. It takes an open mind, because if one insists that it has to fit physiological, physical, and bench optics, then it will not work and no observations will be made. If it is taken as you see it when you set the stage properly and create an intellectual situation where some decisions will have to be made by the patient you will get the response, and you will know there is something more going on than just an eyeball looking at, and seeing, something in front of it.

This paper completes our discussion of the basic visual development observations made in the early years of study on children.

In the next papers, the basic sequence of tests will be discussed. The application and interpretation of this series of tests make them very important to anyone who is seeing preschool children and providing visual guidance for them. An optometrist need no longer feel that a child is too young to work with in the office. We now can begin clinical observations with reliability as early as six weeks. Guidance programs can be outlined for children as early as 3 months. The tremendously important developmental period from birth to 18 months can now be utilized by optometrists to promote the visual abilities with which every child should be equipped, for vision is the dominant factor in behavior.

VOLUME 30 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPTOMETRIC EXTENSION PROGRAM · 1928 ·

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

September - 1958 Series 2 No. 12

This paper, twelfth in this series, seems to be the most appropriate one for a more detailed discussion of the application of the observations covered in the previous issues. The increasing demand from parents for examination and care of very young children is placing optometry in the position of authority and dominance in the field of children's vision care. The following is typical of many such letters being received by optometrists all over the country:

"Dear Doctor:

Our four-months-old baby has one eye that is slightly crossed. No one outside the family has noticed it, but Dr. ----- (physician) advises us to wait awhile, as he seems sure it will correct itself.

Do you have any advice on this matter? Are there exercises, or help I can give her to be sure it will correct itself? I do not want to lose these important first months, or take any risks in 'waiting awhile.'

Thank you for any advice you have to offer.

Sincerely,

Mrs. L. G."

On the basis of what has been discussed in this series of papers, let's take this letter and use it as the background information for a case approach and handling.

The letter above was answered as follows:

"Dear Mrs. G-----

Your letter of the 18th is appreciated.

Your 4-months-old baby interests me very much, because of my special interest in the visual welfare of all children. I would like very much to see her and her visual situation, because if there is any reason to be concerned, now is the time to give her help.

It is not entirely safe to assume that children will outgrow some of the conditions which might account for the situation you have noticed. In fact, I have just been studying postgraduate material which emphasizes very early attention for any suspicious visual condition. We now know that there is a real possibility that 'waiting' could make the situation worse instead of better. I have also read a booklet written especially for the parents of infants which details the things that can be done to assure proper visual development in the first six months of life.

There are several important things I would like to know about your baby's visual condition at this time, and these I can determine if I may have some time with her. Thus, I can give you full and more dependable information, rather than just an opinion. I have some time open on the appointment book at 10:00 A.M., Saturday the 21st, or I can see her at 2:30 P.M. on the 24th.

I certainly shall be happy to see your baby, and will look forward to discussing her visual situation and its care with you.

Thank you for writing, and I shall anticipate word from you about one of the above appointment times.

Very truly yours,

--------------O.D."

The interest and awareness of her child's visual development being shown by this mother is great enough to prompt her to write for advice or assistance. As a rule, when such a letter is received by an optometrist, he should realize that this parent will accept the suggestions made regarding an appointment, and then prepare himself to see the child. This he can do by determining what tests he can use, and what responses to look for in a four-months-old child.

First of all, the sequence of total organismic development should be considered and reviewed. Even at the age of four months, the first motor patterns of eye-hand coordination can be observed. Cephalocauda flow (paper No. 2) should be apparent in movement patterns of head, eyes, mouth, arms and torso. If the infant's eyes are gaining the motility that we can expect at four months, there should be gross teaming movements observable with some hand-eye combination evidenced by his visual interest in his own hands. We should also be able to observe fixation with convergence of both eyes on the dangled bell. Release may be slow, or we may see a monocular release - one eye will make an immediate shift and the other will follow after a slight delay. Horizontal motilities will be limited with more freedom to one side than to the other. There will be some movement of eyes without head movement, but most fixations will be maintained by the four-months-old on the Z axis.

At this age the child will usually bring both hands into action, and he will make some spontaneous movements toward the dangled bell, or he may look at his hands, then at the bell. These movements of eyes and hands should be very carefully watched, because the presence or absence of the growth processes toward ocular teaming and motilities can be observed very adequately now. By five months of age, eyes will pursue, to some extent, both to right and left, with hands reaching and closing in upon the bell. Gesell says: "Primitive prehension is being achieved -- with eyes as the pathfinders -- and the infant is taking hold of the world with his eyes before he takes hold with his hands." (1)

There are frequent queries from young mothers and fathers when their child is three and four months of age, because of the asymmetry of the early movement patterns. These "one-sided" movements of early infancy will contribute to an appearance of "immobility" or "lack of control," which parents interpret as a squint. Actually, these asymmetries are normal in the course of development, and careful observations during an examination will probably allow us to see each eye over-holding to some degree. It is most important to ask these parents if they think the "crossing" they have seen is always of the same eye.

The flat, broad bridge of an infant's nose also contributes to an appearance of squint at these early ages. Because of the tonic-neck-reflex patterns of the earlier months there will now be slightly more ocular motility to one side than to the other. This will allow the child to turn eyes without head movement, either to right or left side, and these movements of eyes will place one eye enough closer to the epicanthus fold so there is an appearance of a convergent squint. The infant referred to in the correspondence above will illustrate these factors.

The baby was brought in to the optometrist by her parents, and her father held her on his lap during the examination. The record of this examination will illustrate the processes of reach, grasp and release discussed in papers #3 through #7 in this series. These notes will also illustrate the basic tests which can be used on a four-months-old child. Furthermore, these same tests are so fundamental to every exploration of visual development and visual abilities that they must be understood as used in infancy to make them valuable to optometrists when examining a patient of any age.

In presenting this illustrative case, the test and the infant's response will be given here just as the examination was done, and as the responses were observed. This will also illustrate the method of recording which provides a running account of the performances observed. When done in this fashion, the dictation to an assistant gives the parents a running account of the child's behavior and abilities, or lack of them. These will be

discussed in sequence.

Dangled Bell:

The bell was brought in on the midline, before the infant's eyes, from 16 inches to about 2 inches. It was occasionally jiggled to attract the infant's visual attention, when she shifted her gaze to her father or to the examiner. It was then moved slowly through the horizontal and vertical meridians to induce pursuit movements.

Responses observed: (recorded here as dictated to assistant)

"At first, right eye seems slightly over-convergent, but infant blinks and both eyes fixate on bell. She looks at bell, then at her hand, and then back to bell. She holds fixation on the bell for several seconds as it approaches her on the midline, then releases to an indeterminant point.

There are some saccadic movements in each direction. These following movements are quick, short jerks of eyes with head movements. Ocular pursuits are equally adequate to her left and to her right, for her age.

She is more aware of the examiner's hand than she is of bell. Her hand movements are a sweeping, or scooping, movement. There is very little eye-hand response, and no spontaneous reaching for the bell. Eye-hand coordination seems more observable on her right side than on the midline or to the left side. She occasionally gets both hands to her mouth at the same time, but right hand is brought to her mouth more frequently when eyes release bell."

Discussion and interpretation:

The reach, grasp and release sequence was repeatedly observed on the bell. This infant reached for the bell with her eyes, grasped it momentarily, then released to visually reach for her hand. The process was repeated as she looked at hand, then visually released it and returned her gaze to the bell. We have evidence of adequate basic bi-ocularity for her age in the blink which occurred as she made her first reach for the bell. She used the blink to "get a new start," and it certainly seemed more than just a happenstance blink.

Undoubtedly, one is on thin ice when anything as natural as a blinking motion of eyes is interpreted as a purposeful action on the part of a four-months-old child. Careful and continued experience in making observations, and complete recording of everything seen, will give every examiner clues and details which provide significant differences between a child's response to a test situation and passive biological activity.

This infant's facial expression of alertness, and the head movement of slight withdrawal which accompanied the blink, make it worthy of recording as an assistance to fixation.

We observed this infant making some of the hand movements which can be expected at this age. There was less spontaneous eye-hand action than might occur by 4 months according to Gesell, but as the test situation was repeated, more complete eye-hand combinations were observed. These were more apparent toward her right side, and questioning of her mother indicated that this child had a right t-n-r. This would account for more freedom and more ability on this side

This infant is beginning to combine sides in the early development of bilaterality. She brought hands together on the midline and brought both hands to her mouth. This is expected behavior at 4 months, with symmetric posturing now replacing the asymmetry of unilateral random movements that were previously dominant. The comments of the optometrist regarding the lack of spontaneous hand activity and eye-hand response brought an interesting comment from the mother.

She stated: "I have wondered about her lack of interest in bright objects near her, but she has begun to show much more of this activity just the past week or ten days.'

The symmetrical activity observable during the examination indicates that this infant is progressing much as we should expect in the course of happenstance experiences.

The responses observed when the bell test was repeated, eye-hand action improving on repetition, certainly indicate that this infant is ready for guidance and opportunistic experiences rather than the occasional or scanty opportunities which may just happen to happen for so many infants. The conference following the examination provided the optometrist with a chance to explain the significance of eye-hand combinations, and the parents were given instructions which will be discussed later in this paper.

Retinoscope at far:

The mother was asked to act as a "far-point target," and scoping was done as the child's mother stood approximately 8 feet in front of the infant and talked to her. The mother was also given a squeaky doll to use as an attraction for holding the infant's gaze at this "infinity" point. Neutralizing lenses, which would distract the infant's attention, were not used, but scoping was done from the usual distance of 26", and observations of the retinoscopic reflex were reported to the assistant by the optometrist.

Responses observed:

"Both reflexes are sharp and bright. There is a normal 'with' motion of low amount, and some fleeting meridional differences are present. Both reflexes are brighter when infant responds to mother's voice. At no time is there any significant dulling of either reflex, even when infant shifts gaze away from her mother. No difference between eyes can be determined during periods of extended gaze, nor while eyes are shifting from toy to mother's face."

Retinoscope at near:

The squeaky toy which mother held was now held at approximately 18 inches by the examiner. A rattle was also used as a target, and scoping was done in the usual manner except no neutralizing lenses were used. Again, the observations were dictated.

Responses observed:

"Both reflexes are bright and stable. When the infant's attention is on the target, there is less 'with' motion observable compared to the far estimate, but no 'against' is observed. There is no spontaneous activity, nor can it be elicited by touching her hand with the rattle. Examiner cannot elicit 'against' motion with these toys."

Discussion and Interpretation:

First of all, and of greatest significance in this instance, both reflexes hold their brightness at both far and near. If there were a 'congenital squint' or a 'congenital amblyopia,' it is quite certain that a dulling of the retinoscopic reflex would have been observed. Here, again, a degree of accommodative reach, grasp and release was observed. This child could viscerally reach and grasp on targets, both "far" and "near." Less release than would be expected at this age was observed, since there was little or no dulling of the retinoscopic reflex.

We have previously stated and discussed the belief that accommodative facility can only be developed out of convergence facility. Although this child is only 4 months old, and neither faculty has had ample development, one should make note of the lack of visceral release for careful attention on the next examination of this infant. We are safe in assuming that sometime during the examination a dulling should have been seen. At least, more fluctuation of the reflex motion should have been observed. Since there is some lack of skeletal freedom, it is entirely feasible that accommodative freedom has not yet been acquired by this infant, and it must be especially looked for on the next examination. The ebb and flow in every visual process must be determined, and this infant is a splendid case example of the need for recognition of danger signals, as well as the need for recognition of stages in the developmental cycles. The second examination in this instance will be of greater value in determining the normalcy of this visual system than the first examination, because the changes, or

lack of them, will be the real criteria.

The meridional differences seen on this first examination can also be related to the lack of motility. These certainly are not the first warnings of an "astigmia" unless this infant does not gain a full and elaborated visual space awareness that can be developed and enhanced by eye-hand combinations. As eye-hand coordination develops, all meridians of visual space will be explored more adequately, and the meridional difference will disappear until a later cycle of more total visual development occurs - in which it will again appear as part of spatial organization.

The failure of the examiner to elicit an "against" motion of the reflex is another point to be noted for later observation. Frequent observations of infants younger than this one have shown that some "against" motion should be observed while mouthing hands or a toy. None was observed during this examination and this, too, might indicate an inadequate awareness of hands andthe eye-hand relationship. We might go so far as to say this infant lacks visceral reach and grasp toward herself. Her lack of experience in the near areas, as expressed by her mother, could easily account for the lack of some of the "nearness" concept which even a four-months-old infant should begin to show.

Gesell [2] says: "Should he seize an object of interest, it goes avidly to his mouth and he tries to regard it even while he mouths it. The whole eye-hand-mouth episode is surcharged with optical implications. This mouthing may be interpreted as a form of tactual-spatial exploitation, which contributes a nucleus to the visual perception of form and substance. The infant seems to be impelled by a sensory-motor appetite. He definitely exploits the objects in a manner which indicates that he is seriously engaged in the developmental organization of visual-tactual behavior." The "against" motion must be elicited later or we may have more definite evidence of a deviation in visual development before the child is 6 months old.

Penlight and Occluder:

A penlight was used as a further fixation target for observation of motilities and alignment of eyes. Frequently the bell is an inadequate test object for infants, and a bright light will elicit responses not observable on the bell.

The occluder is used to determine alignment behind the cover, and to note the infant's response to a cover.

Both penlight and occluder were used in standard fashion except that the examiner was very careful not to let the occluder touch the infant's face.

Responses observed:

"Reflections of the penlight on the corneas are completely centered. Fixations hold better on penlight than they did on bell, especially on midline. Pursuits are still saccadic in nature.

Infant is very aware of occluder as a cover over either eye. Seems more aware of cover before right eye than when cover is before left eye. This is worthy of special note since parents reported right eye seemed to turn in more frequently than left eye."

Discussion and Interpretation:

Since the human is a phototropic organism, it is important to observe the improvements in fixation and the awareness of occlusion when a penlight is used as the target. Here, also, we have evidence that each eye is biologically adequate. If either squint or amblyopia were present, it would have probably shown up in the infant's response to the occluder. When there is a lack of awareness of occlusion of a deviate eye, it is very observable. It is especially reliable as a test during these early months - moreso than it is later when the child is in the "right or left" stages of binocular development. When care is taken so the examiner does not touch the infant's face or head with hand or occluder, the child's immediate shift to avoid, or look at, the occluder is definite evidence that the covered eye is operating as a sight mechanism.

An internal examination was made with the ophthalmoscope. Although the infant was attracted by this light, enough of the retina was visible to assure the parents

that both eyes were completely normal in structure and free of pathology or disease. Emphasis was placed on the fact that we must learn to use eyes, and since there was no pathology, this was a learning problem to some degree.

The epicanthus fold and the broad nose were carefully discussed, and the parents were shown why one eye appeared to be crossed when fixation was slightly off midline.

The organization of eye-hand behavior was discussed, and every possible eye-hand game was recommended for this infant. Pass the rattle, spoon play, and toys which could be suspended over the crib were discussed.

The parents were carefully coached on helping this infant to find, and look at, her own hands. They were shown how to hold the infant's wrists in such a fashion that she would be sure to see her own hands. The parents were asked to place baby objects in contact with, and into the grasp of, the hand at which she was looking. They were instructed on what eye-movements to watch for, and how to observe eye-hand combinations and the co-ordination that we would expect to ensue. They were urged to play peek games with the baby and to talk to her as they had routine daily playtime with her.

The rapport with these parents was excellent, and their questions and remarks were very appropriate. The importance of the second examination was explained, and an appointment agreed upon for four months later. A fee for the examination, conference and recommendations was set, and the parents were told that the next examination would be charged for on an "office call" fee basis.

Here, in an illustrative case, we have the important story of the foundations of visual development as they have been presented in previous papers. The next paper in this series will start a new volume. Although the title of the series will remain the same, the material will concern additional tests of visual development. These tests are now an essential part of every visual case study where readiness for scholastic performance and achievement in academic demands are the reasons for the appointments in optometric offices.

These tests do not, and cannot, replace standard visual analysis procedures. They can, and do, give optometrists the added information so essential in assisting the young patient who has "had glasses but they did not do him any good in school. He is still failing in spite of all the help everyone gives him." These tests, now so important to many optometrists, provide a real appreciation of the dominance of vision in human behavior. The discussions of <u>visual development</u> in the past ten papers have been presented in an effort to lay the groundwork for the discussions of the <u>development of visual achievement</u> which follows in the next volume.

OPTOMETRIC EXTENSION PROGRAM 1928

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE DEVELOPMENT OF VISUAL ACHIEVEMENT

October - 1958 Series 3 No. 1

Repetitiously and redundantly, over and over, again and again, these statements are made: "Vision is learned"; "A child learns to see just as he learns to walk and talk"; and, "A child is born with the mechanism for vision, but he must learn to use it." These ideas have become so familiar that we may begin to take them for granted without full appreciation of what they mean.

We sometimes mouth these words very glibly to educators and to parents, but forget or neglect to convey the basic concepts of visual development and visual achievement. Parents and teachers say: "You tell me a child must learn to see, vision is not inherited, but you leave me confused when it comes to the reasons this child is still not achieving in school. Evidently he has learned to see very well because he has 20/20 on the nurse's wall chart."

We again state our favorite slogans, and add: "but 20/20 on the wall chart is not enough - even a chimpanzee can see this well, and besides, most of a child's work at school is up close, and this is a different task than a wall chart at a distance of 20 feet."

The parent replies: "Well then, nearsightedness is a good trouble for my child to have, since he doesn't use a blackboard very much, and does use workbooks and textbooks a lot." We optometrists find ourselves in a hole that we verbally dug for ourselves in our attempts to convey our functional concepts to others who are not familiar with our philosophies. We next try some quotations from authorities outside our immediate discipline to get out of the hole we find ourselves in, hoping that these names will justify the clinical approach we wish to use for the child we are discussing.

How can we avoid these embarrassing moments?

1. <u>Talk less</u> - <u>demonstrate more</u>.

   If no additional tests were available to us, those already presented in this series can be used to show parents and teachers why a child is not achieving visually - even when he has 20/20 and "normal eyes." Pursuits, fixations, and the reach-grasp-release processes in each motility skill can generally be pointed out to parents. It is not difficult to explain why a child is having problems in visual tasks when the visible machinery stutters and jerks, grabs and misses, or overholds so a degree of preservation prevents keeping up with the group.

2. <u>Talk about performance, and what the child can or cannot do, rather than "our philosophy."</u>

   Parents want to know why <u>their</u> child is failing. The <u>do not</u> want to hear how wonderful <u>our</u> concepts are. This does not mean we should not sell Optometry as the only profession capable of solving the child's problem - but it does mean that we give parents something concrete, something they can see and understand <u>before</u> we give them anything as abstract as a philosophy which might even be a little vague in our own minds.

3. <u>Use tests which parents can recognize as tests of visual performance - where they can see the difficulties their child is having.</u> The Analytical Examination is the most valuable sequence of visual perceptual tests thus far devised. It tells us more about visual performance than <u>any</u> test of human behavior developed by <u>any</u> other profession. It is

a sequence of performance tests - if we fully recognize all of the skills and abilities which underlie each technique that is included. The visual abilities series, so beautifully outlined and discussed in your Optometric Extension Program papers by C.W. and E.I. MacQuarrie, is another important sequence of performance tests, which we must now recognize as advanced tests of vision. Again, we must know what underlies each response in the sequence, if we are to use these tests as demonstrations. Since no parent can see through his child's eyes, having the parent look through the phoropter, or stereoscope, does not always demonstrate the child's problem as we would like. More observable tests of a child's visual discriminations of size, shape, likes, unlikes are significantly useful when the child's performance in school is being discussed.

For several years we have been using two batteries of tests which we have called, a) the basic tests of visual development, and b) the advanced tests of visual perceptual development. Now is the time to get more appropriate names for these two batteries. The basic sequence of techniques should be called the Visual Performance Series, because these are tests of the validity and reliability of visual performance in basic ocular mechanisms. The advanced sequence of techniques should now be called the Visual Achievement Series because these are tests of the visual performance skills most closely related to achievement in the academic environment of our primary classrooms.

Thus, we have an extension of our armamentarium for the investigation of visual behavior in the genus homo from infancy through adulthood. The addition of the above two series to our unique optometric clinical approach gives the following four developmental levels for the investigation of vision:

Level 1. Visual Performance Series

Level 2. Visual Achievement Series.

Level 3. Visual Abilities Series.

Level 4. Visual Analysis Series.

Now we can clinically approach visual behavior at any level necessary for study and analysis of the stage and degree of visual development which exists in the patient under consideration. If the fourth level - the visual analysis series - is not informative because of patient's visual inadequacy, we can make our clinical approach by using the third level - the visual abilities series. If this does not produce the information we need, for analysis of the patient's problem, we can use the second level - the visual achievement series. Finally, when questions of visual behavior are still unanswered, we can use the first level - the visual performance series.

The papers that will reach you in this coming twelve months will elaborate and discuss these first two levels. So that we may work toward a discussion of the interrelated aspects of every test, in later papers each of the tests now being used will be presented. Optometrists are reporting better communication and rapport with parents, and other professional people, because the tests provide more adequate demonstrations of children's visual problems and allow a more pertinent discussion of children's performance.

We have considered five tests in this past year: 1) dangled bell; 2) far retinoscope 3) near retinoscope; 4) stereoscope; and 5) book retinoscope. These tests have bee discussed as they related to the development of the basic visual mechanism. The techniques for each test have not been pre sented in a specific fashion, because we wished to review and generalize the concepts of visual development. It is now quite important that the specific routines and techniques be outlined, so there will be uniformity of procedure that will assure a basis for extension and elaboratio of the developmental concept as it applies to vision and optometry. Further, the observations and interpretations of every optometrist working with young children can thus be pooled because of a uniformity of approach and language.

The first test in the Visual Performance Series is the dangled bell test. This was discussed in the January, 1958 paper, but will be reviewed here to give a complete and sequential outline.

Visual Performance Series

Test I. Dangled Bell

Purpose: to investigate ocular mobility and degree of development in:

1. Reach - grasp - release processes.
2. Reciprocal interweaving in monocularity, bi-ocularity, and binocularity.

A. Materials:

Cat bell on black thread allowing a suspended target which will permit greater freedom of hand contact by the child or adult being tested. The bell can be rotated, jiggled, and jingled to attract and hold the attention of the very young children. The examiner's hand is above the visual line of sight and thus is less likely to become the target.

B. Technique:

Bring bell in on the patient's mid-line at eye level, or very slightly below this level. Move it in toward the bridge of the patient's nose slowly and continuously, with the patient's attention directed to it by spinning, jiggling, or the instructions, "Look at the bell," "See the bell," "Watch the bell."

1- Reach:

Hold the bell on the mid-line at a distance of 12 to 14 inches from the patient. Note whether or not the patient visually reaches for the bell before any instruction is given him.

2- Grasp:

Move the bell in on the mid-line to within 2 or 3 inches of the patient's nose. Hold it at this point momentarily, to observe the patient's stability of ocular teaming, and his ability to maintain bilateral fixation.

3- Release:

If the patient does not look away from the bell after a brief moment of fixation at 3 inches, instruct him to do so by saying, "Now look at me."

Repeat the entire sequence to see if repetition shows any change in performance. Repeat the sequence once more to note whether the patient's hand will spontaneously come in to touch the bell. If he does not bring hand in to touch, pinch, or hit the bell, hold the target at the 6" distance and ask the patient to pinch or touch the bell with his forefinger. Note any changes in ocular teaming, reach, grasp, and release, when he uses hand.

4- Pursuits:

Now move the bell, neither too slowly nor too rapidly, but smoothly through the horizontal, vertical and diagonal meridians. Hold the bell at approximately 10 to 11 inches, or use the Harmon Rule (knuckle to elbow distance) to determine the appropriate position of the target. Urge the patient to maintain pursuit without head movement by saying, "keep your eyes right on the bell," "watch the bell just with your eyes," or some similar phrase which will convey that you want eye movements without head movements.

Repeat to observe the difference in pursuit performance with repetition. If eye movements are jerky, have the patient point at the bell with his forefinger, but do not allow him to touch it. If head movements persist, cup the patient's chin with your hand, or gently hold his head, and again repeat. In cases of minimal squint, or alternating fixations, make careful observations of the differences between monocular and binocular pursuits.

C. Observations:

1. On Reach:

a) Does the patient find the bell quickly, or does he have to search for it?

b) Do both eyes find it simultaneously, or does one eye lead and the other follow?

c) Does the patient bring hand in almost simultaneously with ocular fixation?

d) Does the patient's head move to either side, or does he withdraw head slightly to assist the ocular reach and grasp?

2. On Grasp: As bell is moved toward him -

a) Does the patient hold both eyes on the bell all the time?

b) Are there any nystagmoid movements within the fixation, or is there any drift of one or both eyes as the bell is moved inward?

c) Does either eye lose fixation?

d) Does the patient lose fixation with both eyes and then try to regain it with blinking or facial contortion? Does he regain an adequate fixation?

e) At what distance does he obtain a bi-ocular fixation - especially if the patient is a minimal squinter?

f) Is the grasp tense or easy? Does the patient bring hand in spontaneously, and what effect does hand participation have on ocular grasp?

As bell is held in a stationary position:

g) Is there rejection, or withdrawal?

h) Does patient's head move away from the bell or toward the bell; to the side, or turned aside; is there a tilt of head up or down to peer at the bell through his squinted lids; does he avoid the test, cover his eyes, blink frequently, or close eyes completely?

i) What movements of whole body, or feet, are there when maintained fixation is demanded of the patient?

j) What words or voice sounds are produced by the patient under these circumstances?

3. On Release:

a) Is the release of fixation from the bell spontaneous, or does it occur only upon request?

b) Is the release an avoidance release, and does it occur frequently, necessitating

frequent instructions to "look at the bell?"

c) Is the release easy and automatic when you have reached a near-point of about 3" from patient's nose?

d) Does the patient overhold and seem unable to release? If so, does hand contact to bell assist or permit a release of fixation?

e) Does one eye release and the other overhold? It is a release of one eye and then the other eye follows in releasing?

f) Does the patient release in a step fashion - with each eye releasing in an alternating step-at-a-time fashion?

g) Does the patient release to one side - one eye holding alignment on the bell, the other releasing to a position of parallelism, and then both releasing this position to look at you?

h) Does the patient use blinking or head movements to assist ocular release?

i) If the patient has a deviating eye does it move to a more bi-ocular position momentarily during the process of releasing?

j) When release occurs, where does the patient look first: to his right, left, across the room to some object farther away than the examiner?

k) Does the patient seem to lose visual contact with all of his surrounds momentarily in the process of releasing the bell?

4. On Nearest Point of Fixation:

a) To what point toward himself can the patient maintain binocular fixation?

b) Can he hold ocular fixation (grasp) momentarily at this near-point, or do eyes lose fixation when you halt the movement of the bell?

c) Which eye will hold on target if both do not; which eye releases first, and is this monocular release a drifting movement, a jerky movement, or a "flop" to parallelism?

5. Effect of hand contact by the patient on reach, grasp and release of fixation:

a) Does hand assist or hinder ocular performance?

b) Which hand does the patient spontaneously use? Is there any difference in the ocular performance when the other hand is brought in?

6. On Pursuits: Horizontal and Vertical.

a) Are the ocular movements smooth, fluid or jerky, erratic, or accurate movements?

b) Do eyes jump to keep up with the movement of the bell as if they were making a series of fixations?

c) Do the patient's eyes overshoot as if anticipating the end position of the bell movement?

d) Does one eye lag behind, i.e., right one lag as bell moves to the left; left one lag as target is moved to the right?

e) Does the patient turn his head at any time during the movement of the bell? If instructed to hold head still, does he move whole body to assist his maintenance of ocular fixation?

f) Does pursuit performance improve or worsen when you hold his head?

g) Does use of hand to point at the target while it moves improve or worsen the pursuit performance?

Diagonals.

a) Do both eyes move in unison?

b) Are the pursuit movements more like stairsteps (a little horizontal, then a little vertical, etc.) than a diagonal sweep?

c) Does the patient tilt his head to compensate or assist in diagonal sweeps?

d) If there is head movement, do eyes lead head, or does head lead eyes? (This observation applies to horizontal and vertical pursuits also.)

D. What to record:

1. Record everything you have observed in a running, descriptive account, in language of performance that the patient, or the parents, can fully understand.

2. Describe the eye movements, head movements, and their apparent observable relationships, without technical or anatomical phrases.

3. Describe the performances seen as they happen during the actual examination. Learn what reach, grasp, and release performances are, so these can be sequentially investigated, and then sequentially described to your recorder or stenographer. If she hears it in developmental order - the patient or parents will too.

4. Record all observations as completely as possible. This is to be your record of the patient's progress, and this first recording is most valuable. Your memory is short!! You cannot remember the details that count!! These little details will have the most meaning later in this original examination, when related tests are being made. These details will have even more significance on later examinations, when progress is being determined. Furthermore, you will become more aware of the entire concept of developmental vision, when you see and record for review, all the developmental phases of ocular and visual performance.

5. Remember, you are studying the foundations of all human behavior. These observations of the patient's responses on the dangled bell can give you the basis for much of his total visual behavior, and all behavior has its reasons. Here, on this test, you are looking at the reasons for expected or deviate behavior in everything else you will do clinically in the optometric examination of a patient.

E. When and what to demonstrate:

As you gain familiarity with these tests and the observations which can be made, you will find many aspects of a child's visual performance that can be demonstrated to parents. At times it is more difficult to demonstrate his own deviation to an adult, because he must accept your word that he is deviating from the expected - he only sees it his own way, deviate or not. The child's inabilities can be made

obvious - if you find some ocular behavior that is obviously a lack of teaming, or a lack of motility. When this is found, bring parents into a position where they can see what you are seeing. Usually, if they stand immediately behind you, looking over your shoulder, they will see what you wish them to see.

1. Lack of motility is observable, and more so if another child in the family is present, who can be used to show what motilities should have been acquired. (It might be wise for you to quickly turn to the sibling, and check him before you use him to "show up" the patient, of course.)

2. Hand-eye relationships are frequently demonstrable. The child's need for hand in gaining a fixation can be obvious in many instances.

3. Head movements can be seen by the parents, and the lack of ocular freedom can be shown. Each of these can be quickly related to school achievement possibilities. Lack of bi-ocular teaming could imply diplopia in reading or workbook. Lack of motility could account for loss of place, or the need of finger or line marker in reading. Lack of motility could account for distractability in the classroom. The child's need for hand in visual tasks could account for slowly done or incompleted workbook assignments. Head movements, without ocular freedom, could account for lack of fluidity and consistency in reading tasks.

   Find several very obvious behaviors, show these, and then go on with the examination. Make your points loud and clear, and then proceed without delay. It is neither economical nor wise to keep parents too deeply involved in demonstrations of their child's problem. No matter how poorly the child performs, too elaborate a demonstration can defeat your purpose, just as surely as no demonstration at all.

   Some caution should be exercised over choice of words to be used in the child's presence. A child who is aware of his poor school achievement will be happy to know a reason for it that indicates he is not "just a dummy." Normal diplomacy will let you choose words that are adequate, but which will not upset the child.

As this paper is being written, the realization of the extensiveness and inclusiveness of the dangled bell test strikes home once more. When this paper was started, it seemed appropriate to touch on this test just to be sure it was included in the complete outline of tests. Now, it seems very important that everyone realizes why each of the above observations is significant to our complete understanding of visual performance and visual behavior. So - next month's paper will continue with the discussion of these observations and their significance in the development of vision as it has been discussed in previous papers in this series.

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPTOMETRIC EXTENSION PROGRAM · 1928

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE DEVELOPMENT OF VISUAL ACHIEVEMENT

November - 1958 Series 3 No. 2

A gentleman by the name of P. J. Bailey is quoted as saying, "Simplicity is nature's first step, and the last step in every skill."

Longfellow said, "In all things the supreme excellence is simplicity."

The apparent simplicity of ocular fixation makes it so easy to assume that everyone is skillful at fixing eyes upon the objects within his surroundings. The philosophies of macular alignment--like the old philosophies of acuity--have overshadowed the processes of fixation by the very antiquity of the theories concerning sight. Since ocular fixation just seems to occur in all humans, and macular alignment of the two globes is the expected ocular behavior in the great majority of humans, any act of ocular fixation has frequently been interpreted as a skillful performance. All this becomes another aspect of the quantity-quality consideration, and the supreme excellence is only simple when quality of response is fully established in the ocular mechanism.

Last month's paper* listed some of the observations to be made and recorded when ocular fixations are being investigated. In the January, 1958 paper, we discussed the fine balances between mobility and adaptive immobility which must be developed as foundations for visual achievement. The reach-grasp-release processes which underlie these fine balances give us much information when we analyze the behaviors observed during the dangled bell tests.

The adequacy of visual behavior--as a reflection of the totality of the whole child--is an aspect of the developmental concept which has intrigued us for a number of years. The four stages of binocularity which we discussed in the December, 1957 paper allow us to analyze the degree of organization in total bilaterality because the level of binocularity a child has achieved is usually directly related to the total reciprocal interweaving of the two halves of his body.

The anatomical, neurological and physiological dichotomy of the human sturcture is something a child must learn to overcome through use and practice. This dichotomy can be useful to a child because of the flexibility and freedom of movement it provides--or it can be a hinderance to a child because he cannot team the two sides as reciprocal units.

In spite of our old concepts of inherent ocular bilaterality which are so beautifully expressed in the cyclopean eye theory, ocular teaming is both a contributor to and recipient from total body teaming. It is this philosophy that has led us into gross motor training as a preliminary to the basic visual training routines of rotations, fixations, and pursuits. This concept can also account for the rather spectacular changes in general coordination observed so frequently after basic visual training was provided for a patient. It is--as always --most important to emphasize that no one test is sufficient for analysis, but the dangled bell can give us more insight and appreciation for the completeness of the total child than many other tests commonly used.

* To conserve space here and reading time for you in the discussion of the observations, please use last month's paper with this one so the outline can be referred to without repetition of each observation listed therein.

The first stage in the processes of ocular teaming actually involves more head movement than eye movements. Ocular movements are limited, and frequently only brief ocular pursuits can be observed. The patient will turn head to keep eyes centered on the target. If the patient's chin is supported, pursuits become erratic and very jerky; in fact, eyes will make a series of saccadic fixations instead of a pursuit movement. When one eye is occluded, the uncovered eye will show more freedom, and there will be fewer head movements because there is less demand for teaming under occlusion.

Fixations on the dangled bell on midline will be quite adequate, because reach, grasp and release can all be achieved by the patient when no pursuit movement is also required. This frequently misleads an examiner who makes a push up test and observes adequate fixation at near and refixation at far. No head movement is required; reach, grasp and release do not need to be maintained, and the patient can appear to achieve an adequate alignment of visual axes. However, this is like putting hands together, palm to palm, and then dropping them to the sides of the body without further use in a coordinated bilateral hand activity.

This same incomplete pattern of teaming can be observed in the hand activities of the young child. He can pattycake, and if he wishes, he can clasp hands together, but he cannot as yet team hands and arms in movement patterns adequate enough to catch and toss a beach ball. Pattycake is a saccadic fixation of hands; throwing a beach ball is a bilateral teaming for a pursuit movement of hands requiring reach-grasp and release processes very similar to those required in ocular pursuits on the dangled bell.

At this stage of development we see whole body movements with arms stiff and clumsy, and with body rotations rather than freedom of arm movements. In ocular activities we see the head rotations and converging on a midline maintained by these head movements. In this stage, the head leads eyes, and ocular control is random pairing instead of teaming. These are expected developmental patterns during infancy, but if head movements persist into later months and years, the freedom of ocular movements will not be acquired, and adequate performance in cultural tasks cannot be achieved.

Our clues of inadequacy will come from our observations of ocular pursuit ability, but as we can learn to see teaming in total behavior, we can almost predict ocular behavior by observing a child at play. The random, limited movements of extremities with torso movements to maintain and support the biologic pairings of the two sides of the whole body is behavior equivalent to the stage we are discussing in visual development.

If any patient 18 months or older is seen who is still in this stage of behavior--either totally or ocularly--training and guidance need to be instituted immediately. If the patient is 3 years of age--or even older--and still in this stage, there may very possibly be comments from parents about occasional convergent squint, or the child will be brought to your office because he now has a convergent squint most of the time.

Furthermore, if you can determine that these patients have not adequately achieved Stage 2 (as discussed in the December paper), all training and guidance must be directed at total teaming through gross motor activities. If we attack these cases at the ocular levels only, the chances of success are limited because there is no over-all pattern of bilaterality upon which the patient can build an adequate and stable bilateral visual pattern.

Under these circumstances a number of observations are most pertinent and significant. When the patient is asked to fixate eyes on the bell, he will have to search for it, and children, especially, will withdraw head or bring hand in for support. On pursuits, head movements will be very obvious, and eye movements will be so erratic you will possibly wonder if the patient is ever "on" the bell.

Parenthetically, many of you are saying you know patients who can catch and throw a ball; who are well coordinated in general body actions; who have total bilater-

ality and teaming well established but who still have no ocular skills. Or, you know patients who have very smooth fluid ocular pursuits and motilities, but fall over the flowers in the carpeting. Remember, we are now in general concepts which underlie the optometric philosophies of visual achievement, and the human being is a superior substituter--he literally spends a lifetime finding ways to deviate from the expected and he will always do it the easy way if he can. As a result, we all see patients who have found a method of beating their problem either by deviation or substitution. A large fact remains--they would have been better total organisms if the proper developmental sequences had been followed and visual skills in each stage of development had been acquired. Therefore, it is still our privilege to establish, or recoup, the visual dominance which will lead our patients of every age to higher levels of cultural achievement.

The guidance for the patient who has not successfully achieved the basic abilities that must come out of Stage 1 can be most effective when the program of care is tuned to this developmental level. The major problem lies in the patient's lack of awareness of his two sides. Lacking this awareness, he has little or no perception of which side is in action, and he especially is confused over which side of his body to use for a specific action. This sort of patient has not acquired sufficient body imagery, and such children particularly make us wonder if they have the neurological system for kinesthesis.

The obvious retardate may have neurological damage, but many children who appear normal in every other respect can be so lacking in body image that they act "as if" there was retardation. Their walking may seem very adequate, but we must always realize that the body structure of the pelvic region is conducive to walking when erect postures are gained by the child. The alternation of leg action, as in walking, can, and does, occur without the reciprocal interweaving of body sides so important to the teamed actions of eye movements. These patients can walk and run, but they have great difficulty hopping or skipping, and the dangled bell tests will predict this in the majority of cases.

The erratic, jerky and incoordinate ocular movements typical of Stage 1 will show this lack of reciprocal interweaving. The gross motor system must be organized by the patient so a body image of side-to-side relationships is achieved before the basic pairing can be achieved in the ocular system.

The Kraus-Weber sequence of body movement exercises, and Angels-in-the-snow movements are essential starting points. The use of the trampoline, when available, is also a basic activity because body sides must be teamed to manipulate the "tramp." Walking boards, balance boards, and jump boards do not provide activity that is basic enough in some cases, and although a patient may learn the trick of using these later devices, he still can be lacking the awareness of each body part so essential to the teaming he must have in advanced skills. The Kraus-Weber routines should be utilized to the fullest extent, both in office and home training, and we now feel these routines, with the variations that can be devised, should be used in every training case.

There will be comments made by physical education instructors or physical therapists about optometry's use of these routines, and we may be criticized for crossing disciplinary boundaries. If we are given an opportunity to explain that we are using these routines so a patient can develop kinesthesis and body image, and to help the patient gain an awareness of "left side so he may better know left eye," the criticisms will cease and cooperation will usually ensue.

Some comment should also be made here about chalkboard routines. These have become very popular, and undoubtedly have brought splendid results in the visual training room. Here again we must consider the information we get from the dangled bell to determine whether or not the patient is ready for chalkboard activities. If the patient has no freedom or control of ocular movements, and head movements are utilized to maintain ocular fixation, the chalkboard is contraindicated until after the above routines have

given the patient an opportunity to establish a concept of direction of movement. The dangled bell tests will usually show that this patient gets no support of ocular movements out of hand activity. Pursuits and fixations will not improve when the patient brings his hand into the test. If eye-hand teaming is not present to some degree, chalkboard activities should be delayed until the basic body movement routines have given the patient a chance to establish "look and point" pairings.

If hand is spontaneously brought into the dangled bell tests by the patient, and improvements in ocular fixations and pursuits are observable, the chalkboard can be added to the above routines. This observable hand support does not mean that the basic body movement activities should not be used, however. Every patient should review some variation of the Kraus-Weber series to be sure that body imagery and kinesthesis are present.

Every reader will recognize the implications here that we must work with the total patient. We are discussing Stage 1 of ocular bilaterality and have actually used most of this paper to duscuss total body movement patterns. Many of us have had the privilege of hearing Dr. Darell Boyd Harmon either at seminars or congresses. We have been amazed at his acute ability to diagnose visual deviations by analyzing postures.

Those of us who have had the unique privilege of knowing and working with Miss Glenna Bullis have been amazed at her keen ability to diagnose general behavior by analyzing visual behavior.

It is the writer's opinion that these two wonderful persons are able to make these highly clinical analyses because they recognize a) developmental sequences; b) the totality of human behavior, and c) the significance of movement patterns. If we can gain a part of their understanding, we will have a greater clinical understanding of vision and its dominance in all behavior. If we are to gain such clinical skills as these two people have, we must begin where the infant begins--awareness of movement and movement patterns. We must learn that ocular fixations on the midline are much more than a concomitant movement of eyes toward each other.

These ocular fixations are the simple but supreme indicator of the patient's awareness of his own midline. Out of this awareness the patient develops his percepts of egocentric locus, directionality, right, left, away from self, toward self and the body coordinates which can be transposed into the spatial coordinates of orientation and the completion of a visual space lattice.

We have observed many youngsters who have failed to establish this awareness of midline and show us a resulting lack of body image. The majority of retardates do not achieve these perceptual landmarks, and many so-called normal children also lack adequate development here.

One child who attended the Glen Haven Achievement Camp this past July is of particular interest because he had been given excellent optometric visual training, but had not achieved the teaming of total body as a foundation for visual achievement. This child was about 8 years of age. Entrance examinations disclosed completely fluid and bilateral ocular fixations and pursuits. These ocular movements were so unusual in this type of child that we asked him if he had ever watched a dangled bell before. He replied that he had done a lot of it in Dr. ____'s office, and proceeded to show us all the ocular movements he had learned.

Further tests on this youngster showed us that he had learned ocular motilities very well but could not apply his skill of eye movements to other visual tasks. For example, when he was asked to draw the visual forms or to complete the formboards, all of his searching for details was done with obvious head movements. Every movement this youngster made was symmetrical. If one hand moved, the other did too. If a task demanded arm movement, he rotated his whole body so both arms would move. He never waved, but always clasped his hands over his head in the typical boxer's salutation, and he could not possibly reach across to left side with right hand or to right side with left hand. He would rotate body to get the action centered in front

of him. This child could walk and run with fair alternation of legs, but careful observations showed these actions to be very gross biological movements without teaming or reciprocal interweaving. He could do the walking boards well as long as he could walk forward. When asked to use a side step, or to walk backwards, he failed and lost control of his feet. Here was a boy who had learned specific organismically unrelated tricks of ocular movements, and all perceptual awarenesses and interrelationships had not been achieved. He could move eyes with what appeared to be a high degree of skill except when the ocular movements had to be incorporated with the rest of his body for completion of a task. He could--and did--divorce eyes from all other actions because he had learned the tricks of the visual training room without integration into total performance.

This boy was intensely trained in the basic motor patterns of the Kraus-Weber series with every variation that could be devised. He was given every possible opportunity to learn teaming of sides. He hopped like a rabbit to establish teaming in lower extremities. He was urged to use each side of his body to break the symmetry and to develop his awareness of sidedness. He worked hours on the trampolines in every possible routine that would give him control of each side. He could do seat and knee drops almost as soon as he got on the trampoline the first time. These are symmetrical actions and demanded no change in his patterns of body movements. However, it took almost three weeks for him to learn to jump on one foot, and to alternate feet while jumping on the trampoline. He had paired his two sides extremely well--but he had never learned to team them.

When the boy first got into the swimming pool, he could propel himself through the water using a breast stroke and a frog kick. A crawl stroke was an impossibility. As he gained awareness of sides and could demonstrate actions involving reciprocation of sides, he could, and did, begin crawl strokes while swimming.

As all of this happened, we found that his control of ocular movements deteriorated. He showed us the ocular performances of Stage 1, and he now had to move his head to maintain ocular fixations on the moving bell. However, he regained ocular motilities with amazing ease and speed. He was forced to break up a trick pattern of ocular control in the process of reorganization and integration. When he became aware of his organismic totality and the interrelationship so essential to cephalocaudal development, all visual processes of reach, grasp and release, ocular fixation pursuits could be organized by him, and his progress was then spectacular.

There is no criticism implied here of the optometrist who trained this boy. The boy was better after the training because he had learned what eyes were through this visual training. His parents were very certain that he had made remarkable gains because of the training as done by this optometrist. The point being made by this case example relates to our earlier statement that we must be very certain we are plugging in with visual training at the developmental level necessary for "whole child" growth and achievement. Here, also, is an example of the fact that fixations and pursuits are not simple processes involving eyes alone. We may assist a patient to establish the biologic pairing of eyes, but if we do not assist him in gaining functional and perceptual teaming, he will have frosting without a cake.

Between "nature's first step" (macular alignment as a response to light) and "the last step in every skill" (the acquisition of ocular movement skills essential to visual achievement) lie the entire child and the muscles, tendons, and articular surfaces of every joint contributing to movements of the integrated whole. Simple? Yes---when supreme excellence is acquired in every process which makes a totality of <u>each</u> part so a totality of <u>all</u> parts will result.

A little cat bell on a piece of string tells us so very much when we look behind the bell--behind the eyes--and behind the visual mechanism at the patient.

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE DEVELOPMENT OF VISUAL ACHIEVEMENT - PART II

December - 1958 Series 3 No. 3

Last month we referred to an 8-year-old boy in illustrating the lack of body image and the failure of children to establish an awareness of midline. We have frequently emphasized the differences between bi-ocularity and binocularity in these papers, and have attempted to elaborate our belief that the latter (binocularity) cannot be fully acquired in the processes of visual development without a full exploration and organization of the bi-ocularity phases. The child who gets stuck in the bi-ocular stage and does not proceed to the unification and teaming stage is frequently more difficult to work with in visual training, has difficulty achieveing proper and expected training gains, and sometime poses a critical problem.

We have known for many years that more successful training cases resulted when we started cases on monocular routines. It has become almost a standard rule of procedure to start every visual training patient with monocular fixations and monocular pursuits. There are cases where this is very definitely contra-indicated, however, and this aspect of the developmental sequence is worthy of serious consideration.

These patients may not be aware of their organismic midline, but it is so definitely established in their performance and behavior that we may observe alternation of whole body sides that is a proliferation of the right or left stage discussed in December, 1957.

These patients are nearly an extreme opposite of the 8-year-old we discussed last month. Instead of being symmetrical in all body actions, they are extremely asymmetrical. One side moves and then holds while the other side moves. The second side then holds while the first side moves again. The movement patterns seem to be established for each side, but reciprocal interweaving has not occurred to team the two sides for any elaboration of bilaterality.

These patients look good in walking and running, and even their writing may be quite adequate. Upon investigation we may find a consistency of right (or left) eye, right (or left) hand and right (or left) foot dominancies which are supposed to make for more adequate performance according to so many investigations of dominance. We believe now that this sort of extreme unilaterality is more an asymmetric behavior than it is a free-flowing dominance that could be conducive to more adequate total organismic performance.

These are the patients who show us very poor ocular fixations and pursuits on the dangled bell. There is an obvious effort on their part to ocularly fix and hold the bell on the midline. They cannot maintain ocular pursuits in any meridian and will demonstrate jerky, erratic eye movement and/or over-release on refixation of the examiner. All ocular movements are extremely poor until one eye is occluded; then fixations and pursuits are smooth and fluid by comparison. These monocular pursuits will not be adequate, however, even though they look so much better monocularly than they do binocularly - because there is still none of the 1 + 1 = 3 that comes from the reciprocal interweaving and teaming where the action of the total is greater than the summed action of the parts.

These patients show rather significant vertical and diagonal ocular pursuit patterns, which are worthy of some comment. The vertical pattern is a zigzag movement which has more horizontal shifts than it does vertical direction. It might be described as an aviodance of teaming on the midline or a "minute alternating squint." One eye holds an approximate position of

convergence while the other follows. Then the holding eye fixes for a short pursuit while the other follows. These ocular movements are difficult to describe. They are not difficult to observe and can only be verbalized as an alternate zigzag downward.

The diagonal ocular pursuits are practically impossible for these patients. We have previously described inadequate diagonal pursuits as stairstep movements. These patients, who seem to jump the midline almost as if it was a high-board fence from the center of forehead to a point between their ankles, completely fall apart when diagonal ocular movements are requested of them. If it is possible to get any sort of ocular pursuit, it is more of a series of saccadic fixations, and this, too, has the appearance of an alternation of reach and release alternated with monocular grasp. Half of the time the other eye is just "along for the ride." Frequently these patients will glance at the bell, but spend most of the time looking at the examiner.

Again, if vertical and diagonal pursuits are investigated with one eye occluded, all movements are much more adequate by comparison. The monocular movements are even better if the bell is held directly in front of the eye being observed. By doing so, the avoidance of midline is less of a factor, and the patient can center unilaterally for greater freedom of movement bi-ocularly.

The above paragraphs describe a situation where movement patterns have been established for each side of the body, and are especially evident in monocular movements and fixations.

Now we must consider several very important questions which should be answered if visual training is to be instituted. (1) What do the basic monocular routines accomplish for this patient? (2) What will further emphasized practice of monocular mobility achieve toward a goal of the teaming of a pair of eyes for binocularity? (3) If vision is the dominant factor in human behavior, what will further emphasis on monocular movement patterns do to the proliferation of total organismic movement patterns? Many of us who have worked extensively and intently with this type of patient have come to the conclusion that such training can accent alternation rather than eliminate it, and achievement levels will not rise on the tasks which place so much demand on the visual mechanism.

Again we turn for example and illustration, to one of the youngsters who attended the Glen Haven Achievement Camp this past summer. This lad, age 12, was enrolled in the Camp primarily because of school failure, and because his parents had "tried everything." He is a handsome boy of excellent physique. He has had every possible diagnostic evaluation. Because of his high scores on various tests, his parents were very sure "he was lazy and could do it if he would just try." He had finally come to the point of rather complete discouragement, and "I can't," or "I don't want to" were his usual replies. He used his mother's solicitude to counteract his father's pressures for accomplishment. He used various gross activities such as butterfly collecting to avoid and escape the more demanding tasks of school work. He was very agile in the gross activities of walking or running after moths and butterflies, and he could swing his net with accuracy one handed. His writing was passably fair with his right hand, but very limited, and left hand was incapable of forming his name.

The ocular and visual perceptual series of tests were most interesting when the entrance examination was done on this boy. Every test was significant, but several of the tests were especially related to our discussion here.

All ocular fixations and pursuits were erratic and jerky, but monocular tests showed improvements over binocular tests just as generally described here.

The introduction of a 4D. prism before either eye showed immediate diplopia, but the double image effect was upsetting to him, and he would close one eye to eliminate the doubling. He was very surprised to find that closing one eye would cut out one light and remarked about it as if he never before had discovered that both eyes could see at the same time.

The red glass test brought further exclamations from him, because he now saw the target light as half white and half red. Although we can never know exactly how another person sees something, it is reasonably safe to assume that this boy's description of "half white and half red" is another indication of the dichotomy which existed in so much of his performance. We had to constantly urge him to keep both eyes open, and on the red glass test the examiner finally had to hold the boy's left eye open with a forefinger. The boy's confusion on every test of basic ocular teaming was very evident.

There was complete divergence of either eye behind an occluder. The uncovered eye could fix the target, but the occluded eye did not hold a position of binocularity and shifted to the basic position of biocularity.

When this boy was asked to hold the book for the book retinoscope tests, he could not point at the pictures. He could hold or point, but he could not do both at the same time. Here also was evidence that he could not combine activities. His asymmetry would not allow him to put hands into related actions. If left hand was holding the book, right hand was in his lap. If he pointed with right hand, his left hand released the book and became inactive in his lap.

His results on visual forms, spontaneous drawing, and incomplete man were especially interesting. All lines were vertically oriented, and the paper was rotated to maintain the vertical strokes. There were few, if any, horizontal lines because here, also, he was unable to cross his own midline in an integrated movement pattern which comes from the integration of the two organismic halves.

This 12-year-old boy was our most bewildering camper because he looked so good. Alternation is so much a proper part of normal gross movements that his real difficulty was hard to uncover. When we were able to observe him more closely in the actual clinical procedures used in the camp program, we found that any movement - either gross or discrete - which demanded interweaving and integrated combination of his two sides was almost an impossibility.

The boy was also very carefully supervised in the Kraus-Weber series of basic movement pattern exercises. Every possible emphasis was placed on bilateral movements to break the asymmetry. The boy we discussed last month was urged to move one leg or one arm without a like movement of the corresponding body part. This boy we are now discussing was urged to keep corresponding body parts in completely matched and balanced movement. Many hours were spent in these gross motor activities in every possible clinical area.

The observation notes of the Achievement Camp Staff are interesting and bear quoting here:

Activity - Writing his name in the sand with his foot.

Comments: "Letters very small and each letter is placed on top of the other. There was no horizontal direction of any kind."

Activity - Writing his name in the air with his forefinger as the pencil.

Comments: "No horizontal direction to movements, and letters were piled on top of each other."

Activity - Swimming Pool.

Comments: "He cannot jump from edge of pool with both feet together. He always leads with right foot. He was instructed to keep hands clasped in front of him, but he continued to lead with one foot and could not keep hands together. Legs were tied together with a short piece of rope. He could not jump into pool with legs tied."

Activity - Crafts and Visual Training.
(a) Swinging a weighted bucket bimanually.

Comments: "He is having difficulty in swinging the bucket from side to side and would not attempt to swing it in a complete circle in front of him. After

much urging he tried but became worried that it would hit him, and resorted to a one-handed hold on the bucket handle. While swinging the bucket from side to side in front of him, he threw himself off balance on the third swing. Right foot turned outward for support from original starting position of both feel parallel."

(b) Long-body swing.

Comments: "He had great difficulty in getting the feeling of permitting arms and body to swing back and forth across the midline. Very erratic after second or third swing, and again threw himself off balance by kicking the right foot out of original position of the feet. Showed much resistence to all this bilaterality training."

(c) Chalkboard: bimanual circles, and lines.

Comments: "Right-hand circle was large and fairly smooth. Left-hand circle was smaller, erratic movements with more vertical direction resulting in long vertical oval or straight lines. When left-hand was used alone, circle was somewhat improved, but immediately worsened when right-hand was also used. Right-hand lines were straighter and longer than left-hand lines. Left-hand lines had poor direction and wobbled across the board. When left-hand was used alone, lines were better, but we insisted upon bi-manual actions."

(d) Ocular Pursuits:

Comments: "All pursuit and fixation training was done with both eyes open. No monocular work was done. All training routines were most difficult and erratic with early fatigue. Some improvements noted as he continued, but vertical and diagonal directions of movement still most difficult."

Activity - Trampoline

Comments: "He could jump on the trampoline for short periods of time if simple jumping was all that was requested of him. Seat and knee drops were very difficult, and fatigue was evident after a few trials. He could not extend legs properly for a seat drop, and left knee would bend, hindering his return to an upright position. His feet would get out of phase, and he too easily lost position and balance on the bed of the trampoline. He could not keep arms extended in a balanced position, nor could he keep hands clasped in front of him, or over his head while jumping. His right side did more thrusting and balancing than left side. When his hands or ankles were tied together in an attempt to maintain some degree of teaming, he would lose balance and fall down. Every other camper spent a lot of free time on the trampolines. This boy was never seen on the trampolines except during regular class period."

Many more notes could be added here regarding this boy's work during the Camp period. One more is significant. It is dated July 29.

"He has recall on simple gross motor only. He does not readily follow instructions if he can verbalize his way out of the activity. He would rather <u>tell</u> than <u>do</u>. His body movement control <u>is still poor</u>. He is very dependent on all previous clues for the lowest integrative processes."

Here then, is a boy who had established the alternation of sides so thoroughly and completely that every attempt at bilateral integration was an almost insurmountable task. For some reason, his developmental processes became stymied in Stage 2 - the right <u>or</u> left stage - and because this let him <u>move</u> about in his world, he did not proceed to Stages 3 and 4 where reciprocal interweaving could produce a <u>total</u> organism

Every gross motor activity demanding bilateral integration is essential to this boy, and here all the chalkboard activities, where eyes and hands must coordinate, are an absolute must in training. By the same token, every bilateral ocular activity must be emphasized and every monocular activity must be diligently avoided.

We believe the questions put to you earlier in this paper can now be approached and answered through the developmental philosophy which underlies this entire series.

This boy - and probably many others similar to him - would further set his unilaterality in the visual mechanism. He has already established a competency of motor patterns for each eye. Further monocular practice would increase his skills in monocular patterns but would not give him much possibility for reciprocal innervation in visual areas when no reciprocity has been established in the total organismic system. In spite of the fact that we firmly believe that vision is the dominant factor in behavior, a specific visual approach to this problem of the lack of bilaterality cannot be fully effective. This developmental deviation must be approached in every possible motor area. The gross motor patterns must be developed so they will contribute to the visual motor patterns, and the visual motor patterns must be developed so they will contribute to the gross motor patterns. If this sounds a bit redundant, so much the better, because it is the redundancy in every area of performance that must be introduced into the clinical program for the solution of this type of visual problem.

We believe that every possible technique which provides every possible opportunity for bilateral action of arms, legs, trunk, and eyes must be instituted if these highly developed unilateralities are to be overcome. Only thus can the developmental processes progress to Stage 3 - the right and left stage - and finally to Stage 4 - the rightleft stage.

Visual Training routines should include:

1. Binocular fixations and pursuits
2. Bimanual grasp on a pointer using numbers or pictures on the wall for fixation targets.
3. Bilateral trunk, arm, and leg activities in every conceivable variation and application of the Kraus-Weber and Bonnie Prudden routines.
4. We feel that all visual training work should be done outside of black box instruments. It definitely seems to us that stereoscopes, cheiroscopes, and any other scopes that restrict movements, cut down peripheral fields, or septum-ize visual action are contraindicated in such a visual training case.
5. When the rightleft stage is reached and total integration is established then, of course, the previous stages should be reviewed through the usual basic routines. It is not our intent to suggest that monocular training should never be done with these patients. It is our intent to emphasize that we must always start where the patient is and lead him through every process which will assure the completion of visual development.

We concluded the April, 1958 paper with these comments: "Before we close this (paper), however, it seems very important to re-emphasize that the process of binocularity is long and very involved. Binocularity is much more than macular fusion and foveal matching. It is actually an end product of all the stages and processes we have considered up until now, plus the many more we shall discuss as we continue this series. We have used the term binocularity in describing performance and behavior in the young child because we wish to indicate the teaming of eyes as a unit. In our concept of visual development, the ultimate in binocularity is not achieved by the child until many more visual processes and total behaviors are interwoven and integrated."

Now, eight papers later, we should like to remind you of Professor Samuel Renshaw's often quoted and most significant comment: "Vision draws heavily upon the other sense modalities, particularly the skin, the

kinesthetics (muscle, tendon and joint sense) and the ears."

For our purposes in this paper we might take the liberty of paraphrasing Dr. Renshaw and say: Visual achievement is made up of total motor bilaterality and visual binocularity - and this can only come out of the inverwoven, integrated, and reciprocal movement patterns of all the tendons, all the muscles and the articular surfaces of all the joints. Visual achievement is a total motor pattern of the total organism.

Merry Christmas and a Happy New Year - may all your joys and happinesses be integrated and reciprocally interwoven for the best year your total orgamism has ever had.

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE FIRST MOMENTS DO COUNT!!

January - 1959 Series 3 No. 4

No matter what fiscal or calendar year goes by, January of a new year is always a time to turn the proverbial new leaf and to reorganize one's thinking for the months to come. During the past year, this series of papers has stressed a basic philosophy of the totality of human behavior. We have especially emphasized the relationships of visual performance to total behavior.

In the recent Bell Telephone Company television show, "Gateways To The Mind," we saw many splendid examples of the integration and reciprocal patterning so necessary for human behavior. One could not help but view this show with admiration, because the technical staff has chosen a very complex and very involved subject matter. Some of us have had the recent added pleasure of seeing this original film in full color, and even with the color added, we were struck with one particular fact. Regardless how well one knows this background of totality, and no matter how capable one might be in making tests and observations of performance, there is another aspect of dealing with behavior which cannot be overlooked. If a clinician does not, or cannot get, the cooperation of the child, or cannot set the stage for participation, all tests and all observations are useless.

When a series of papers such as these is written, the authors must give many hours of thought to the context before any words go on paper. Only the most professional and experienced writers are like artesian wells. In the many hours of considering how to convey the most pertinent information, one question keeps appearing: "How do I get the child to respond?" We should like to use this January paper to achieve two purposes. The first is to help you gain the assistance of the child, and the second is as an introduction to a manual which is now in preparation and which will reach you in the very near future.

This manual will be a complete outline of tests, how to administer each test, and what performance to observe. As many readers know, we have had special postgraduate classes either at Luverne, Minnesota, or at Purdue University during the past few years. Working outlines were designed for these classes and with the able assistance of Dr. Homer Hendrickson, Dr. W. R. Henry, and Dr. Wayne Knight. These outlines are now being prepared as a manual.

It seems to us the most appropriate introduction to this manual should concern the child as he walks through the office door, and before he enters the examining room. It is difficult for most of us to realize that this is the most critical moment of the entire clinical procedure. The child's first impression of you and of your approach to him will either set the stage for his participation, or will destroy any possibility of gaining the information you must have to provide the type of visual care and guidance only optometrists can deliver.

At least once a week in the past 15 years, parents have commented about the manner in which their child had been handled in a previous (usually non-optometric) examination. Either they were upset by snap decisions on the basis of inadequate or incomplete clinical procedures, or they would not accept the diagnosis because the doctor "could not handle our child."

If you want to work with children, you must realize first of all that the child who enters your office is an individual with a background of experience which is strictly his own, an awareness of the world which is strictly his own, a judgment of people which is strictly his own, and an awareness of what others do to and for him which is completely unique and

personal to him.

Our greeting to a child too frequently takes two extremes. Either we approach him as a baby and get mushy with him, or we treat him as a small adult and become too serious. Somewhere there must be a happy medium where we neither have to talk down to a child, nor do we need to overwhelm him with our professional mien.

It is of extreme importance that the information we have gained preceding the appointment (from the parent interview forms) gives us some bit of conversational material with which to approach the child. Knowing the name that the child prefers is very important to the child. A brief conversation period in the reception room with the youngster puts him at ease as a general rule. This conversation should always open with something of interest to the youngster rather than his reason for being in the office or what is to be done with him.

The children's corner in the reception room, which has been advocated for so many years by Dr. Ralph Barstow, is important for more reasons than can be listed here. If you find a child who is very reluctant about the whole situation, five or ten minutes "wasted" as he plays with the Blockraft or the toys will gain you hours when his examination begins.

Dr. Richard Apell of the Gesell Institute has made some very splendid suggestions for handling children in the introductory period. He makes five very important points:

1. The examination begins the moment you present yourself to the child.

2. Be friendly and smile but don't grin.

3. Be pleasant but don't emote or over compliment.

4. Any comment about the child should be about what the child is wearing or doing but never personal about the child.

5. Have a ball or toy in your hand to engage in some simple activity.

We should like to add that if the child still shows reluctance, just sit quietly in his field of awareness and then perhaps start your conversation about the toys with which he is playing.

These few moments in the reception room can give you much information about the child's capabilities in the examination to follow. Your assistant should accompany you and be prepared to make notes on your observations. If the child works rapidly and jumps fleetingly from toy to toy, you can be prepared to make your tests in a similar tempo. If, on the other hand, the child is deliberate and thorough in his play explorations, you can expect to hold him in test situations for long periods of time. His particular choice of toys in the play corner will provide clues concerning the objects which might be more useful in the actual examination.

Your observations of his posture, his use of hands, the stability of ocular fixation as well as his interests, will give you many clues. These clues will make the transition to the examining room a continuation of his play period rather than a sudden shift from what he is doing, and enjoying, to something entirely different that you wish him to do. For example, if he is interested in a simple puzzle, wait until he has finished, and then take him into formboards or "another kind of puzzle" such as visual forms or incomplete man. The toys you choose for your play corner should be those that will appeal to the majority of children, but should also be those which will let you move the child to a similar activity in the examination.

In moving from the reception room to the examining room, your language with the child is very important. Usually you should not ask the child if he wants to go into the other room. If you give him a question which indicates that he must leave the thing he is enjoying, ninety-nine percent of the time he will say, "No, I want to stay here." You should make a definite statement such as "Now, let's go into the other room and find some more things to play with." Sometimes the child will hesitate, not because he doesn't want to go, but because

he may not want to leave his parents. If you see this hesitancy, say, "Now, bring your mommy and daddy and let's go find some other things to play with," or "I have some more things that you will like to play with - bring mommy and daddy so they can see them too." This sort of conversational instruction keeps you in constant control of the child without being domineering or without being mushy. They immediately get the feeling that you want them to have a good time.

The moment you enter the examining room you should be prepared to provide something of interest to the particular child you are working with. If he is completely congenial and willing to go along with your requests, the chances are good that you can immediately put him into the examining chair. If he reaches the examing room door and then becomes reluctant, show him some pictures or some more Blockraft, or get him to the chalkboard (that we now assume everyone has in the examining room). As soon as the child does any one thing in your examining room, you can proceed with the examination and move to new activities with the proper preparation.

In general, when dealing with children, it is always well to remember that they do not like surprises. They need to be able to anticipate a change in activity and changes in location of activity. No matter how well a child is performing in a test situation, if you suddenly shift to something different, you will have to wait for the child to organize himself toward the new activity. From the moment he walks in the front door until he leaves at the end of the examination, every activity should be presented to him in advance by some kind of statement which lets him know that "pretty soon he will do something else that is also fun."

Of course, all children are not reluctant. Some of them have so much freedom at home, or even when away from home, that you must maintain some sort of checkrein on the child. If you find one of these youngsters that rams through the examining room door and begins to paw through everything that surrounds him, very definite discipline should be established immediately. This can usually be accomplished by challenging the child to see if he can keep hands to himself or only on those things which you wish him to handle. The most satisfactory discipline comes when you give the youngster a choice of participating in the test or leaving the office. In nearly 15 years only one child has made the choice of leaving. When children find out that you are interested in them as an individual, and that you wish them to do things for you, they will usually co-operate.

All children, both normal and retarded, like to be challenged. As so frequently stated by many investigators, all children are normally curious - in fact, it is now felt that curiosity is the only general innate characteristic of all children. The proper presentation of materials and the proper communication between you and the child arouse this curiosity, and this is the stuff out of which co-operation in test circumstances develops. As soon as the child realizes that you are on equal terms of give and take in a test situation, he will prefer this activity to being deprived of it. Even the most difficult retarded child will respond to the choice of participation or deprivation.

There are a number of verbal techniques which are important in gaining the response of the small child in difficult test situations. We have found over the years that there are a number of general verbal approaches that can be utilized. Reliable observations are usually determined by the manner in which you phrase your questions. It is always important to avoid any questions which can be answered merely "yes" or "no."

Further, your questions must be so phrased that they do not give a clue to the answer. For example, if you are using a prism for a test of bi-ocularity, do not ask the child if he sees two lights. Ask the child "How many lights do you see now?" Many young children will be able to tell you definitely when it is one light, but cannot tell you for certain that there are two lights. Instead, they may say four, five, or whatever other number they might know. Thus, you get the information that it is different than one.

You will find that if you give a choice question, he may repeat whatever you said

last. For example, if you ask on the prism test, "Is it one or two?" the child may answer "two" because it is the last number he heard. If you must use this technique of questioning, wherever possible repeat the test but change the sequence of your phrasing. For example, the second time you would say, "Now is it two or one?" If the child continues to merely say what you are saying, then you can begin to wonder about his being a parrot rather than an observer of a visual situation.

The extremely talkative child is sometimes difficult because he asks so many questions that he can lead you far astray if you allow yourself to be led into answering each question. On the other hand, if the child does not have some kind of answer, he may then cease to co-operate. It is well to handle this situation by promising the child that you will visit with him about his questions as soon as the test sequence is over. If you make such a promise, it is important that you keep it, and visit for a few moments with the youngster as you said you would. Frequently the child will have forgotten many of his rambling questions and will be satisfied with a little visit. It is not wise to entirely ignore his questioning because if you allow him some conversational freedom, he may give you some very excellent information about his interpretations and awarenesses by the quality and validity of the questions he asks. If you ignore him completely, you may miss the very bit of information you need to complete your analysis of this particular child.

Again, we should like to quote Dr. Apell. He lists a number of "Dont's," which we should probably memorize, or thumb tack to our mental bulletin board. The first of these he lists is: "Don't baby talk." Children do not appreciate this sort of approach, and become embarrassed because, more often than not, they feel you are making fun of them. On the other hand, it is wise that you take a clue from the youngster's choice of words. His method of pronounciation may be much more meaningful to him. A most common example of this comes in any test situation where you want to know whether a chart is blurring. Most children will know what you mean when you ask, "Is it worser now?", and if you have preceeded such a question with, "Is it changing now?", the child will often use the word "worser," and you have your clue.

Number two on Dr. Apell's list is: "Don't overtalk." Many of us overtalk most of the time. We are like the recent flighty female patient who had her mouth open so much of the time there wasn't room for her ears. If we overtalk to a child, he most likely will say to himself, "I try to tell him what I see, but he won't listen." If we take an easy, interested, quiet attitude, giving a child a chance to organize his thoughts and his choice of words, we will get better answers from the child. If, on the other hand, we overtalk, we keep him off balance and give him no opportunity to organize his thought because he doesn't know which questions we want answered.

Another important suggestion from Dr. Apell is: "Don't put on false airs - a child can spot a phony." Actually a child's judgment of an adult's sincerity is very accurate. He will know when you are over praising or overemphasizing some aspect of his behavior that is not important to his welfare. If, for example, his visual findings have not changed, don't tell him how much better he is because he has done his home training routines. He will know whether or not he did them, and you may find yourself in the spot of praising him for something about which he knows you have no evidence

It is far better to ask a child point blank about his visual activities. All children are basically honest and appreciate honest questions. If you give a child a chance to weasle around an honest answer, he will doubt the honesty of your questions. Children have not learned how to lie except as we teach them how to avoid the truth.

Dr. Apell says, "Don't let parents become involved in the examination in a negative way." This, of course, is the frequent problem we face in dealing with parents sitting in on the examination. There are times when you want parents in on the tes circumstances. If you will take a moment before the examination starts to tell parents what the situation is, what you are

looking for, and to emphasize to them how well the child solves a new situation all by himself, they will usually not continue to interfere.

There is one more "Don't" from Dr. Apell that is tremendously important! "Don't spend too much time on any one test - come back to it later if necessary." If a child is reluctant to participate in a test because it is difficult for him to do, he will likely gain confidence by achieving in other activities and be more willing to try the difficult one. Children have the satisfaction of success and the disappointment in failure that is typical of all humans regardless of age.

It is not uncommon for a child to resist a test situation that he recognizes as being a chance for failure, and we should not continue to insist that a child stay in a test situation under these circumstances. As you continue to work with more and more youngsters, you will know when you can push through on a test, and when you must take what information you can get and proceed to other observations.

If you go on to other tests after deciding that the child is having particular difficulty and find that he does other things well, then you should return to the first test and attempt repetition. If his difficulty with the test is indicative of a lack of skill, other tests will verify his problem, and you need not force specific performances. When to move in on a child, and when to release him from a test situation are insights that you will gain with experience. You will readily understand that the younger the child, the more quickly and deftly you will have to act in making your observations.

There is another "Don't" that we should like to add to Dr. Apell's suggestions! "Don't act so much like a doctor that the youngster is immediately reminded of hypodermic needles and dental drills." We frequently ask the parents not to call us Doctor in front of the very young child. Thus, we find that there need be no reference to discomfort which the child may have had in previous doctor experiences, and co-operation is assured earlier in the office situation.

We have been discussing the actual clinical situations which will exist when the child is in your office. There is another important aspect of your examination which cannot be overlooked. As you are dealing with children, and more than one examination will be necessary if you are to know the child's visual development, you must be prepared to get all possible information on paper. You should record or report to your assistant everything the child does. When the notes on the examination are complete, you should have a word description of how he appraoched each test and how he performed in it. THESE NOTES MUST DESCRIBE HIS PERFORMANCE - NOT YOUR INTERPRETATION OF IT. You need a record of his present abilities and behavior and your interpretation will come as you read over your notes and make an analysis of them. Furthermore, your interpretations now or at a later date will most likely change with experience, more knowledge, and more insight. If you record only your interpretations, you will find that it is impossible to look back to previous examinations to make comparative evaluations of behavior.

If you are using an assistant to record your comments during the examination - and we certainly hope you are - encourage your assistant to make observations also. Such procedure will give you more than twice the information because you will have verification and extension of observations made by you. You will learn what things are important in the record, and so will your assistant.

As you have repeated experience in examining children, you will also find ways to simplify your recording and methods of shortening the recording time. As this series continues, we shall probably be able to give you further case examples, but we should like to refer you to the September, 1958, paper for an actual example of the observations made, and how they were recorded exactly as dictated.

We realize that this is the shortest paper that has appeared in the series, but please do not let its shortness de-emphasize its importance. We should like to have you read this paper carefully, and then outline it so that you can memorize

the important points before you see the next child in your office. We should like to suggest that you apply these techniques on your own children at home. You will find that the suggestions made here are very dynamic and positive, and will characteristically gain the co-operation of every child. You will find yourselves in a position of manipulating children without dominating them, and you will open the door <u>for them</u> so they are able to perform to the best of their ability. It is well to remember that no child likes to be forced, but he does like to be led.

In preparing this introduction for the manual, which we mentioned earlier, we feel that a discussion of our philosophical terminology is important, and we shall proceed with this groundwork in the next paper.

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE PROCESSES OF VISUAL DEVELOPMENT

February - 1959 Series 3 No. 5

In last month's paper we emphasized the importance of the first moment of contact with the young patient in your office. We concluded the paper with the comment that a discussion of our philosophical terminology would be presented in this paper.

There are several excellent reasons for this discussion because the language we use must be well enough understood by us that we can make it understandable to the patient, or the patient's parents. In these past five or six years much time has been spent and much thought has been given to the terminology that will most adequately convey the developmental philosophy. This nomenclature has to convey ideas and concepts to optometrists and then has to be adaptable enough to convey ideas and concepts to all of those to whom these ideas were new.

Oliver Wendell Holmes stated, "Many ideas grow better when transplanted into another mind than in the one where they sprung up. That which was a weed in one becomes a flower in the other, and a flower again dwindles down to a mere weed by the same change. Healthy growths may become poisonous by falling upon the wrong mental soil, and what seemed a night-shade in one mind unfolds as a morning-glory in the other."

This quotation expresses every aspect of the problems we have had in conveying these new concepts and ideas on developmental vision. Many of the men around the country, deep in this work with children, are constantly amazed by the manner in which some parents understand, and accept, the program laid out for them and their child. The same men have frequently commented that they are amazed at the complete rejection on the part of other parents when a similar type of guidance was laid out for their child as was laid out for those who accepted the program.

Under these circumstances we are always prone to blame the parents for their lack of understanding and their lack of concern for their child's welfare. As a rule we were to blame because we did not have the concept well enough established in our own minds so that it could be transplanted into another. We knew the words because we had heard them used, but a lack of full understanding resulted in a lack of communication in many cases.

All of this, however, is a part of the price we pay for progress. New ideas are never easily and freely accepted, but our percentage of acceptance can be increased as <u>we</u> gain a deeper grasp of the meaning of the words <u>we</u> use.

Our language is both a tool and a trap, because so many words have so many different meanings. This is the very reason many hours have been spent in establishing a vocabulary. Some of the words we use in these papers and others that will be used in the manuals, which are being prepared, need definition and explanation to avoid the damages of the double-entendre.

When definitions are written, or spoken, the author knows perfectly well what he means and what he is saying based on his framework and background, but the reader has to assume what the author meant based on the reader's framework, understanding, vocabulary, etc. If these papers and the manuals which will accompany them are to be of the greatest possible value, both the author and the reader must have a common language to assure fullest possible communication.

One of the most frequently used words in this series of papers is the word, "behavior." Over the years this word has taken on a negative connotation. We have thought of behavior as being something bad

or undesirable, or as being related to deportment. Those of you who have read the writings of Dr. Gesell and Dr. Piaget are aware that behavior is a manner of action. Webster says, "Behavior involves the general tenor of our actions and is a development of the individual."

What we observe from the time the youngster walks in the door until our examination is complete and he leaves the office, is the behavior in which we are interested. How he uses his hands, how he makes visual inspections and decisions, how he makes judgments and visual discriminations, how he fixates the dangled bell are all behaviors which determine his visual development. The moment we talk about "good" or "poor" behavior we are implying deportment, and although it is related, this is not our concern in our determination of his visual status. Since we are primarily concerned with the development of skills and performance abilities, we should consider the child's behavioral adequacies or inadequacies. If we avoid the terms "good" and "bad" we are more nearly describing performance rather than deportment. As we continue to observe and work with children in the preschool ages, we shall learn which performances are adequate for their stage or level of development. Whether we realize it or not, we have always interpreted our findings in the analytical and in the training room on this same basis. A low finding in the analytical is an indication of inadequate performance. The inability to achieve the expected in any visual training routine is an inadequate performance. If we can all clear our thinking so that all our observations are made on the basis of adequate or inadequate behavior according to age or type of case, we shall have a more complete concept of visual development.

One of the problems we face in being definitive is that by the very act of defining we imply or state a separation of parts. This is a very acute problem whenever we attempt to define stages of development. There are three general stages in visual development which we must discuss, and we can only hope that our description of these three stages does not indicate that they are segregated or isolated areas. Though the three stages are names and described as being entirely separate, and behavior might be described as segregated activity, these three stages are closely interwoven. They are so intimately interwoven and interrelated, it is not possible to have one stage operating without some degree of the others present - even though they are not readily observable.

The first of these is the motor development stage. We feel that most optometrists today have a fairly clear-cut idea of what is meant by motor development, but on occasion we still find a lack of conceptual relationships between motor development and ocular behavior. We must think of every child as a growing action system, and we must realize that this action system includes all of his equipment for behavior. This means his total neuromotor system and, of course, we can readily recognize that his eyes are very much a part of this.

The action system develops as a total unit in a head-to-foot (cephalo-caudal) direction. Head, eyes, and mouth take the lead. Shoulders, arms, hands, torso, legs and feet all follow in due order. The development of this motor system does not proceed homogeniously in a straight course or on an even front. It fluctuates in pace, in direction and in stability.

As a result, we often see a youngster in the clumsy stages where his motor system appears to be most inadequate. In appraising motor development, these variations must be recognized. The clumsiness may well be a stage of transient disequilibrium, and this apparent in-coordination may have a very positive value in the overall mechanism of development. It may represent a thrust into new areas of adjustment and school attainment. These thrusts result in growth gains and are consolidated during a later period of equilibrium which is also followed by another period of loosened equilibrium. By such fluctuations the organism advances through successive stages of increased maturity and motor organization.

All of this contributes to the unity and totality of the organism through reciprocal interweaving of all underlying structures which make up the entire motor system. Thus

equilibrium and organization lead to bilaterality and biocularity, which in turn lead to total coordination and binocularity. This motor development of the total action system should be understood and applied in training procedures which utilize balance boards, walking beams and the other devices now becoming popular.

Furthermore, if we are to make use of these devices, we must be able to recognize the levels of development within the motor development stage. The head-to-foot (cephalo-caudal) direction which determines the course of development should also determine the course and selection of training procedures. If a youngster has little or no control of the head end of his body, we should not expect him to gain control of the foot end - as required by balance boards and walking beams - without an opportunity to incorporate the torso in between. The incorporation of the torso in all activities is easy to overlook in a clinical procedure.

One of the reasons we have put so much emphasis on the Kraus-Weber series is their effectiveness in developing awareness of torso. We have frequently found that the child who did not incorporate his torso could not roll, and although he may have gone through the all-fours creeping stage, he did not gain enough of the cephalo-caudal continuity to "corkscrew" himself across the floor.

Much time was spent with some of the youngsters at the Glen Haven Achievement Camp having them roll down the hillside so they could learn the body twist that would allow them to roll on flat surfaces. It probably has been many years since any of us have been down on the ground or the floor to do some rolling. We should like to suggest that you try it so you may feel once again how you must rotate shoulders and hips to get yourself rolled over. If all you can do is twist the upper torso, and the hip region or lower torso does not contribute to the corkscrew motion, you will find yourselves just about in your original position. We have long noted that some children have freedom of movement in the shoulder area but act as if they had no familiarity whatsoever with the seat of their pants. The child places his feet on the boards. All balancing is done without feet touching the floor.

Balance boards have been redesigned for some other children so that this torso activity was emphasized. These boards were 18" wide and 4' long with a 3/4" strip of wood the full length of the board in place of the small square support used on the usual 16" by 16" boards. The children would seat themselves on this board with legs placed straight before them. This variation of the balance board demands that all balance be controlled in the hip and buttocks region, and brings new awareness of the areas between the child's head and feet. This literally assists the child in learning to "fly by the seat of his pants," and his improvement on standard balance boards and walking beams is almost immediately observable.

We have named the second stage of visual development the integrative stage. This is the process of putting parts together to support and enhance each other. It is more advanced and more complex than the interweaving of sides or increased motor organization.

When speaking of integration we usually think of the use of eyes and hands together as the most observable example. The reader will recall that we have frequently talked about how a child learns to see first with his tongue, then with his hands, and finally with his eyes. Unless one realizes that there is a tongue-hand integration followed by a hand-eye integration before a child can see with his eyes, this description of the sequence is somewhat meaningless. One could possibly think of hundreds of integrative processes which go on constantly and which are involved in any activity.

There must be a basic integration of parts in the digestive system so biochemical balances are achieved. The more complex integrations are those which bring together the parts of the child which are not as obviously interrelated as the digestive system.

For the purpose of our discussion here, the eye-hand sequence is our most appropriate example. It is also the easiest to observe, and the proper test sequences give us much information concerning the develop-

mental maturity of the child.

As the infant's motor system allows and leads him into random action, arms and hands show us random movement patterns. The infant, through his motor development, learns to direct these arm and hand movements to reach and grasp for his soft toys and rattles. As contact is made, he becomes aware of something worth looking at, and the same motor development which lets him direct these arm and hand movements, allows him to direct his eye movement toward the object in his hand. With continued practice he finds that he can pick up the object he wishes and makes visual inspection of it. At first, the objects he picks up are those which his hand just happens to contact, and in this stage we feel the hand is leading eyes. In later stages we can observe the child as eyes make first "contact" with an object, and then hand follows through to grasp and explore. In earlier stages he probably gets most information out of the feel of the object, and eyes merely inspect and add to his exploration of the object. In the later stages eyes make first contact, and he uses hands more to verify and elaborate his interpretations of this object that his eyes have picked up.

This integrative stage is the process of making combinations, and we can see the same levels of development in eye-foot integration for distance interpretations that we can see in the eye-hand sequence for size interpretations. We have seen many children who could throw a bean bag at a box with a fair degree of accuracy. These same children, however, could not tell us how far away the box was until they had walked it out so feet could verify their visual judgment of the distance.

The small child who stands before a mirror talking to himself and watching his mouth is making eye-mouth integrations, just as he does as he watches someone speaking to him so that he can imitate the mouth movement of others.

The model drawn for us so frequently by Dr. A. M. Skeffington to illustrate the input, integration, output, and feed-back sequence is descriptive of all human behavior just as it is descriptive of the visual process. In drawing his diagram, Dr. Skeffington emphasizes that in the integrative area all other bits of information are fed in and loaded upon the visual datum. It is important for us to realize that much of our training and guidance is directed at this integrative process.

If our visual training patients learn only the tricks of the instruments and do not integrate this visual information with total organismic abilities, we shall see no improvement in the case. When training is done as described by Drs. Francke, Kraskin, Wiener, and others, where an individual stands on a balance board doing circles on paper while doing ocular rotations, the changes are excellent that integration is being demanded.

If, on the other hand, a patient is seated, dead and heavy, on a chair while he is doing rotations, the chances are good that the ocular machinery is the only part being used.

The significant difference between the retardate and the individual with standard social and scholastic achievement probably lies in the integrative stage of development. The old saying about a person not being able to maintain activities at one time is in great error. Developmental organization demands that many more than two activities go on at the same time, and the more behaviors and activities that can be integrated and interrelated, the more capable a total organism we become. The other extreme is the severe retardate whose hands wander aimlessly grasping and brushing, touching and releasing, while his visual mechanism also wanders aimlessly with no degree of combination in the two performances.

Thus, the term <u>integration</u> can be defined as the developmental organization and combination of the many motor systems inherent in the human being. These combinations come through practice and the use of the motor skills gained through time and growth The integrative system is that aspect of the total organism which determines our readiness for the acquisition of informatio through more than one input avenue. Thus, we can see, hear, feel, taste, and smell a piece of candy, and each of these inputs is integrated to give us all the information

there is to be gained about a piece of candy.

The third stage we wish to discuss and define has been the most difficult for us to clarify in our own hands. We have called it the perceptual stage, and there have been long hours of early morning argument about using this term. Many of our colleagues have felt that this third stage should just be called the visual stage, because the definition of vision as given to us by Dr. Skeffington was inclusive enough to convey the idea of the processes in this stage.

This definition as stated by Dr. A. M. Skeffington is, "Vision is the process of synthesizing and abstracting the experiences of the organism and mobilizing them upon the instigating trigger of a visual datum."

There is no doubt in our minds that Dr. Skeffington means this statement to be all-inclusive, but we know that some men have interpreted this as related only to the visual experiences. We wish to emphasize what Dr. Skeffington has also been emphasizing lately, that we must have an all-inclusive concept concerning the experiences of the organism.

Others have commented that by the use of the word perception we were implying an encroachment upon the philosophies of other professions. Still others have maintained that a more inclusive term than vision (such as the term perception) was essential to our acquiring a full concept of the significance of this third stage.

Here again we face the old problem of vocabulary, nomenclature, and terminology mentioned earlier in this paper. Some of us have clung to the term perception because we were afraid that some men, deeply indoctrinated in the anatomy and physiology of the eyeball, needed a term which would take them away from their old frames of reference. Actually, it makes no difference whether we use the term vision or perception, or if we combine them and say visual perception, if we are fully aware of this third stage which makes genus homo completely unique and superior in the animal kingdom.

As motor development proceeds and allows integrative elaboration in the total organism, the time comes when the visual mechanism of and by itself can acquire information which previously had to come through all other receptors. The visual mechanism can convey to us the size, shape, and approximate weight of an object without our needing to make hand contact and exploration. The visual mechanism can tell us about the distance between ourselves and an object without our needing to step it off. The visual mechanism can tell us what a mouth is saying by the visible lip and tongue movements without our needing to use ears to hear the actual speech. The visual mechanism can give us surprisingly accurate clues as to the taste and aromas of a chef's product. Even from the pages of a magazine the visual mechanism can, in the ultimate stages of development, provide us with all information that all other receptors can give us. This level of visual development which allows us to use the visual mechanism as a substitute and a superseder for all other mechanisms is the process we have called perception.

Dr. Gesell says, *"Vision is a complex sensory-motor response to a light stimulus mediated by the eyes, but involving the entire action system." We have presented in this paper three generalized, sequential, yet interwoven stages in the development of vision. The manner in which we have presented them is much too generalized, but we must have some basic concept as a framework for all the intricacies of visual behavior. We must obtain a common language which is definite enough to let us understand each other and still loose enough to let us understand the development of visual performance. Thus, we can see the child in the various processes by which he gains the visual stature for achievement in our advanced culture.

There are some other aspects of our philosophy which should be discussed before we tie these papers up with the manual which is being prepared. Our classwork and group discussions of this philosophy have shown us that consideration of some of the stages within stages can be most helpful, and next month's paper will get a bit more specific in these areas of visual development.

*VISION: Its Development in Infant and Child, Pg. 162, Hoeber, 1949.

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

THE PROCESSES OF VISUAL DEVELOPMENT - II

March - 1959 Series 3 No. 6

In last month's paper we presented three generalized, yet interwoven, stages in the development of vision. There are, of course, many stages and many processes involved in visual development. We must always be aware of the complexity of vision and the totality of its interrelatedness. The models of vision that have been built for us by Drs. A.M. Skeffington and Samuel Renshaw infer more complexity than most of us realize. Professor Renshaw's frequently quoted statement that vision involves the muscles of the neck, back and articular surfaces of the joints, suggests a very complex system. It also suggest much more than is recognized by most people when they think of vision.

The papers by Drs. George Crow and H. L. Fuog now being presented by the Optometric Extension Program are undoubtedly the finest collection of printed material related to developmental vision. Every issue of these papers gives material which is very valuable in our attempt to gain an understanding of visual processes. A particular paragraph in the November, 1958 issue is very pertinent to the material we wish to discuss in this paper.*

We are taking the liberty of quoting here, but the whole paper should be reviewed after you have completed this one.

"The next matter for consideration will be the various ocular skills and sub-skills. These represent the physiological stimulus response mechanisms which appear as certain definite forms of ocular behavior and result in certain psychic visual impressions. A careful study must be made of each step so far covered in order to fully appreciate the nature of the various elements which have become interwoven into the fabric we must analyze during a visual examination and which we must be prepared to improve through corrective optometric methods. All these underlying strata of movement patterns are actuated through the great brain network, which in turn is presided over by a mind."

This particular paragraph just quoted caught our attention because of the comment about the various elements which have become interwoven into the fabric of vision. The action patterns observable when an individual, regardless of age, develops hand and eye coordination are very significant. The sequence of development here is quite clear cut, and if we can gain a working understanding of the sequence, much of our patient's performance becomes more informative.

Here again we feel that there are identifiable stages in the processes of hand-eye coordination. In the past few years we have attempted to find a terminology which would be adequate and most expressive of what we can observe. We talked about the kinesthetic visual processes, but this seemed to be too all-inclusive because kinesthesis involves so much more than just hand activity. We then tried to identify these stages as tactual-visual levels. This created some confusion because there are so many implications in the word, tactual, and considerable explaining was necessary.

We feel now that since we are describing performance, it is better if we use terminology which is descriptive of the performance. As a result, the four stages which we wish to discuss are as follows:

1. The hand stage.
2. The hand-eye stage.
3. The eye-hand stage.
4. The eye stage.

*FUNDAMENTAL PRINCIPLES OF VISUAL TRAINING, Part II, Pg. 15, Series 8, No. 2

As this paper is being written, we realize that there will be some quibbling about the above terms because everyone keeps on saying, "Vision is much more than the eye." We shall be the first to agree and insist that this statement is true, but in describing the processes of hand-eye co-ordination we are using these words to describe the motor systems involved in the performance we wish to observe.

The hand stage is most observable in the very small child, because in infancy we see all of the groping random hand movements as the infant comes into contact with his external world. During this stage the child is constantly grasping and releasing every object that happens to be within his reach. We could almost say the child has not yet found out that he can also look at the object his hand has found. He explores and manipulates these objects but does not visually inspect them. We frequently see this type of performance in the retarded child, who for many reasons may not have discovered that eyes can give him further information about the objects he handles. These children especially are prone to depend on hand contact to such an extent they develop a degree of skill in hands that can become an interference to them if we demand that they make visual inspection.

One youngster in particular comes to mind as an example. Stephen was one of the campers at the 1958 Glen Haven Achievement Camp. His was probably a case of retrolental fibroplasia, but we had many evidences that he had more visual ability than he had learned to use. Because of the diagnosis given to his parents at the age of three he was treated as a blind child. For a short period of time he was even encouraged to learn Braille.

Typically, this youngster, now age nine, depended on touch and hearing and did not use eyes any more than he needed to for occasional orientation. One of the parents at camp described his behavior as being "up periscope, take a look, down periscope, go."

This youngster could not carry on a conversation unless his hands were in contact with the other person. If by accident he bumped into someone, he depended on his hands to make identification of that person. The youngster was so skillful in doing this, he did not lift his head and constantly looked at the ground even whil talking to others. We made numerous observations of this child and came to the conclusion that he was almost entirely in the hand stage of development. By carefu guidance and training we found that he could use his eyes, and we saw him go through the rest of the stages being discussed in this paper.

The story told by Dr. O.J. Melvin of his personal experiences in learning a visual space world illustrates this hand stage. Dr. Melvin reports that every movement he made was preceded by a hand movement or contact. He readily admits that his visua space was so inadequate he had to depend on his hands for orientation and identification.

This stage is frequently seen in the developmental examination of primary school children. It is most obvious when we find a youngster who cannot achieve a visual fixation on the dangled bell unless he touches it. It is even more observable during form board and size block tests where we observe children judging shape or size by the "feel of it" rather than the "looks of it." These youngsters who depend so much on hands perform as if their perceptual development had not progressed beyond this stage.

The second stage - the hand-eye stage - shows us a performance where hands are leading, and eyes are following. In early childhood we still see the hands in random movement, but the moment the child grasps an object in his hands, he brings his eyes to the object for further inspection. Here also, we see eyes release the object befor hands release it to pick up something else Careful observations of young children lea us to believe that eyes were only in actio for the moments of casual visual inspectio

Repeated observation with the retinoscope has shown us that the retinoscopic reflex brightens after the hand contact and dulls before hand release. We have felt for some time that this is the beginning of hand-eye coordination.

This stage is observable in the standard

examination routine on many patients. Although the degree of coordination between eye and hand varies greatly, the dependency upon hand is frequently noted in duction findings. It is common to find that a recovery on duction findings can be obtained only when the patient touches the near-point chart. For years this was blamed on the small apertures of the phorometer, and although this may be a factor, the recovery of a single chart when hand is brought in cannot be ignored.

This hand-eye stage is easy to see during the examination of a preschool child. It is most observable when we find that we can only elicit ocular pursuits if the youngster points or follows the target with his hand. In the retarded child this stage is probably more clear cut, and thus more observable. Here we frequently find that we cannot get ocular performance unless we work through hand. This, however, can now be interpreted as a degree of integration which has been achieved by the child. If we can observe that some magnitude of eye-hand combination is available to the child, he has progressed above the hand stage at least, and perhaps additional development can be acquired.

We have made many retinoscopic observations in our attempt to identify and understand the eye-hand stage. If we could recall all of our early observations of young children, we might find that this stage is the one that gave us the clue to the other three. It is during this stage that eyes lead and hands follow, or support. The retinoscopic reflex will show an increased brightness and an increased stability when hands come into the act.

Observations of young children have shown us that eyes search out an object, and then hands come in to pick up and make further inspection. The reflex will show us a brightening when the hand contacts unfamiliar objects that does not occur with hand contact on familiar objects. Here we see hand as a reinforcement to the visual activity where, in the previous stage, there was a dependency upon hand. In this third stage our observations lead us to conclude that hands are brought in when the eye (and of course the entire visual mechanism) cannot achieve sufficient information.

This stage is also observable in many of the tests we use for both adults and children. We find adults sure of their discriminations and more accurate in their judgments when they hold a test card in their hands. Children show us more accurate fixations and pursuits with hand contact on the bell or penlight. We see the child making very adequate visual judgments of obviously different sizes, but he must bring his hand in for reinforcement of his discriminations when sizes are only slightly different.

This is the stage most commonly reported by teachers and parents when children are having trouble in reading. Our examination may show quite adequate pursuits on bell or penlight, but the behavior reported by parents and teachers would indicate that the child's reading is very jerky and erratic. We can assume that part of the jerky reading is because of his unfamiliarity with the printed words, but if this youngster is more accurate and reads more smoothly when he uses his finger, we can assume that he is depending on hand for reinforcement. It has been our observation that when hand does not smooth out a child's reading, it probably is more of a lack of reading skill than it is a lack of visual skill.

The fourth stage of the processes we are discussing in this paper almost speaks for itself. We have called it the Eye Stage to indicate that the visual mechanism has achieved that level of skill and self-sufficiency that it no longer needs hand for reinforcement. In this stage the visual mechanism gains the information it needs through eyes alone. As long as the individual is in familiar activity where experience and practice provide adequate integration, perceptions are complete. This is the ultimate stage in this process we are discussing, and the individual has now gained visual skill.

We should like to refer again to the paragraph quoted from the papers of Drs. Crow and Fuog. This statement opens with the sentence, "The next matter for consideration will be the various ocular skills and sub-skills." We should like to have you see Stage 4 as the skill level and Stages 1, 2, and 3 as the sub-skills necessary for visual achievement. Stages 1, 2,

and 3 are the elements which have become interwoven into the fabric we analyze in a visual examination.

If we can recognize in which of these stages the patient is operating, we shall have a much better chance of reaching a successful visual care program for this patient. If the patient is operating in Stage 1, a lens prescription will be of little value. By the same token, advanced visual training will not be productive. In such a case, all the basic motor training will have to be instituted before the patient gains an awareness of his eyes as a part of hand-eye process.

If we find our patient in Stage 2, lenses should probably be prescribed only on the basis of refractive necessity. If we have an extreme refractive error, we must consider a lens prescription for its contribution to the validity of input. Very possibly eyes have not come into the act because of a high refractive error. If we find nothing unusual in refractive status other than an instability, our recommendation should be visual training, and this should be done with hand leading eyes. Here we would use pointers and chalkboard routines rather than advanced black box techniques. If the lens prescription can be delayed, we may find surprising changes in refractive status on a progress report. Frequently in such cases we have found that our retinoscope findings were more reliable, meridional differences disappeared, and the ametropia is surprisingly reduced.

In Stage 3 we usually find that standard lens and training procedures bring very satisfactory gains in performance. It is as if the patient almost achieved his goal, but did not quite complete the entire process. Lenses are prescribed according to analytical rules, but training is given to enhance the effectiveness of the lenses and to carry the patient into the fourth stage.

If we find our patient in this fourth stage, he will probably respond quickly and adequately to his lens prescription unless some unusual demand is placed upon him.

This matter of an unusual visual demand is an aspect of visual performance which we should briefly consider in this discussion. We have reviewed the stages of the development of visual performance. We must not assume that this process occurs only in the earliest years of life, but must recognize that the process reoccurs throughout lifetime. Any time that we enter a strange situation, we revert to the stage necessary to the solution of this situation.

If we find ourselves in a position where we have had no previous experience to assist us in a solution, we may even revert to Stage 1. Usually our experience with similar situations will provide us with enough information so that we have only to revert to Stage 3. This reversion to Stage 3 is a common daily occurrence to most people, and is always observable in dime stores, hardware stores or kitchen utensil departments. Here we see children men and women reverting to the third stage and perhaps even to the second stage, in their exploration of a new item.

We concluded last month's paper with a comment regarding the stages within stages This paper has presented the development of eye-hand coordination as one of these. If you will review the February, 1959, paper, you will see that the motor-integrative-perceptual sequence is interwoven with the stages discussed here. The December, 1957, paper in this series will give you a review of reach, grasp, and release processes, and the relationship of these to our discussion here will become apparent to you.

It is important now that we go into the clinical "whens," "wheres," and "hows" of developmental guidance. Next month we shall start the discussion of the procedures for developmental training.

OPTOMETRIC EXTENSION PROGRAM 1928

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

"DEVELOPMENTAL CARE AND GUIDANCE - I"

April - 1959

Series 3 No. 7

At this time a discussion of the clinical "whens," "wheres," and "hows" of developmental guidance is in order. Therefore, we shall now outline for you many of the methods which allow a total approach to visual development.

The methods are no longer theoretical procedures. The techniques have had nearly ten years of clinical testing. Many optometrists around the country have incorporated these routines into the training room activities. These men have found many new and advanced methods which have been discussed and passed on to others, who, in turn, have verified and elaborated them in their individual offices. Thus, each technique has been screened and improved until we learned which were most effective.

Parents have become "clinicians" and have contributed to the work. Thoughtful, considerate parents have not only followed optometric instructions in providing home training for their children, but they have also developed routines beyond the suggestions given them. This knowledge has been passed back into the profession. Optometrists have incorporated these elaborations into training rooms and then passed them on to the parents of other children under their care. As a result of all this, the procedures have had critical analysis by those who were more personally concerned with their child's progress than even the optometrist.

Every optometrist working with children has a deep interest in the child's welfare, but because of very normal circumstances, he does not have the heartache and worry over the child's achievement that is typical of most parents. Thus, the parents have provided us with a testing ground inhabited by observers more capable of judging a child's achievement than most clinicians.

The procedures which have come out of optometry's study of child development have had still another critical audience in the related professions. Education and psychology have looked into optometric methods with great care. Many in these fields have become very interested in the optometric concepts, and as a result, have put a number of these procedures into use. The results have been very gratifying to everyone who has the child's welfare at heart. Many of these people have reported on their work and the results they have obtained, and here again we have been able to verify our optometric procedures.

The guidance of children is not limited to one group or to one profession. Thus, we have found that this communication between disciplines has contributed to a better understanding among all of them. As a result, each has benefited. Furthermore, the real recipients of the benefits are the children themselves. As is always true, those who thought they were "stealing secrets" have found themselves with nothing but methods without the concepts.

There has been one very significant final testing ground for these procedures. For the past two summers the Glen Haven Achievement Camp has supplied an ideal and carefully controlled clinical situation in which these procedures could be applied and analyzed.

We have frequently stated in these papers and from the lecture platform that the retarded child is only slightly different from the normal child. The fact that the retarded child is still a member of the human race and is organically structured according to the common pattern, means that his basic process of development is the same as that of the normal child.

The two four-week periods in Colorado, where everyone concerned worked toward a common goal with each child, allowed us to apply these procedures to the individual problems. This has not been a case of "armchair deduction." It has been an opportunity whereby the philosophies of development could be applied in every living situation. The emphasis on functional visual development was the significant difference between this camp and others. At Glen Haven everything was done for a visual reason, and every procedure was related to visual development in some degree. The results of our efforts to apply the developmental concepts are significant even to those who have no understanding of the philosophies utilized. Every child made progress greater than could be attributed to time alone. As more time has passed, reports and further tests on many of the children have shown their continued improvements.

These procedures, then, which are related to organismic development (with emphasis on the dominance of vision) are valid. As we learn to recognize the individual problems, we shall learn to recognize the methods most applicable. As we learn to apply our methods, we shall learn to recognize the individual problems. Thus, the techniques of investigation and the techniques of guidance will be reciprocally interwoven with a resulting gain in achievement for every child we see.

Probably the greatest problem that confronts every profession dealing with children's performance relates to the presence or absence of achievement. In the first place, achievement is a very difficult thing to define. Webster states that achievement is the act of performing or executing; it is something accomplished; something finished or carried on to a final close. Webster defines an achiever as one who achieves or accomplishes.

Although Mr. Webster is definitive, the criteria by which we judge achievement are not definitive. We have talked for a number of years about the nonachiever in school, but as we have learned more and more about children and their developmental growth, we have come to realize that we must clarify in our own thinking what we mean by "the nonachieving child." We must begin to differentiate between the child who visually succeeds in everything except school, and the child who has not developed the integrated visual levels that would permit him to achieve in standardized academic situations. From the optometric viewpoint both of these children have visual problems. They require a different approach for effective and constructive visual care and guidance. So far as the demands of our culture are concerned, both of these children are nonachievers.

The first one mentioned above - "He's smart in everything except school work" - is the least understood of all children. Because he is alert and smart, everyone expects him to succeed. As a result, the pressures on him are always greater than on any other child.

The child who has not developed organismic totality is not expected to keep up with the pack, and as a rule, the pressures on him are not as great. The reader should realize that there are many individual levels of achievement between the two extremes discussed here. For the purpose of this paper, it is important to identify the more obvious problems.

There have been many attempts by many people to analyze the relationship between visual performance and scholastic performance. It is a well-known fact that most of these studies have been fruitless because the investigator attempted to draw his conclusions from irrelevant facts. Everyone is familiar with the attempts to correlate school success with an acuity chart. Much has been written about the relationship between visual skills tests and school achievement. All of these studies have been inconclusive because of the lack of understanding of the visual performances involved in any level of abstract performance. Too many of the tests which have been used have asked the wrong questions. The answers obtained from many tests have been so mechanistic in nature that they could not be projected accurately into any other area of performance.

Psychologists have long realized the inadequacy of subjective testing, and both psychology and optometry are developing projective tests. These tests are giving

us methods of analyzing related behaviors because the tests are a probe of a very basic behavior. Thus, the alert and thoughtful examiner becomes aware of the relationships that exist between visual performance and intellectual performance in every cultural task. Projective tests of visual performance can give insight for the individual's performance in social or occupational areas as well as in academic areas.

Spontaneous drawing is probably the best example of this type of test. The child projects his concepts of his visual world into his drawing. Furthermore, his drawing allows us to judge his freedom to abstract and synthesize his previous experiences and to produce for us a representation on paper. It seems quite logical to assume that the only tests which will correlate visual performance will be projective tests.

If achievement, according to Mr. Webster, is the accomplishment of a totality, we must understand all of the underlying factors by which the individual reaches this totality. Once again, we must state our belief that the developmental concepts can substantiate and elaborate our concepts of vision and can determine what really constitutes visual achievement.

As we gain an understanding of visual achievement, we can then approach the nonachieving child and program care and guidance for his individual case.

Since it is easier to communicate ideas when a common ground exists, an illustrative case can give us this common ground. J. was a boy in the sixth grade, age eleven. His visual history was typical, and he reported no discomfort related to visual activities. He had never experienced any blurriness on near-point activities, and reported that he could read the blackboard from any seat in the room. He liked arithmetic best, and felt that arithmetic was his easiest subject. His hardest subject was reading, and he reported that he had to do a lot of re-reading because he would frequently lose his place. It helped him to use his finger, or a marker,* in keeping his place, but he would still miss lines and miscall words. He was frequently told by the teachers not to hold his book so close. His unaided acuities were 20/20 each eye, and 20/15 binocularly at far and near. There was some jerkiness noted while he called letters on near-point binocular acuities. His performance on the visual ability series was adequate, and J. showed no difficulty in any area except tests of macular fusion. His Analytical findings are given as follows:

#3	1 eso	
#13A	2 eso (#13A and all near-point findings were taken at 15 inches according to the Harmon norm).	
#4	O.D. +.25	With slight meridional difference.
	O.S. +.75 to +1.00	Unstable.
#5	O.D. +1.50 -50 x 90	
	O.S. +1.75 -50 x 90	Both variable.
#7	O.D. +.50 -50 x 90	
	O.S. +.50 -25 x 90	(For best V.A. discrimination slow but adequate. J. seemed to make better discriminations with cylinder, although not necessary for 20/20).
#8	2 eso	
#9	6 eso	
#10	14/4 Smaller. Away.	
#11	5/0	
#13B	3 exo	
#14A	O.D. +1.25	
	O.S. +1.50	(Response quite definite but more stable with the cylinder of #7).
#15A	6 exo	
#14B	+1.00 O.U.	
#15B	2 exo	

*Refer to February, 1959, paper this series. p. 29.

#16A	10	
#16B	22/12	
#17A	6	
#17B	24/12	Smaller. Away.
#19	O.D. 3.00 O.S. 3.00 O.U. 3.50	
#20	-2.25	Very slow.
#21	+2.25	(J. rubbed eyes after examination and commented how tired they were.)

The first analysis of the Analytical findings showed a B1 case without too many complications. His near tests showed the nets indicating acceptance of plus, but the general discriminations and responses noted during the examination made the examiner suspicious of the effectiveness of plus. Certainly plus should be accepted by J., especially for classroom wear and homework. The meridional differences and the instability of the retinoscopic reflexes were the first clues the examiner had to proceed with caution in the immediate prescription of lenses as the solution to his problem. If this had been a youngster who reported discomfort and blur at reading, and who had been maintaining reading achievement at sixth-grade level, the examiner would not have been so reluctant to immediately prescribe a plus lens.

A review of the developmental history, as given by the parents of this boy, indicated the possibility of a more basic problem. (The information gained from this developmental history pointed up the value of getting such information on every child experiencing a school achievement problem regardless of age.) The appointment was made because of his poor reading ability, and further questioning brought out the fact that he had never been a good reader, and had received remedial reading instruction in several grades. J. repeated first grade because he was "immature," according to his first-grade teacher. His developmental history showed nothing unusual in his childhood or infancy. There was doubt in the parents' minds as to early motor development, but it wasn't unusual enough for them to remember anything in particular. They did report that his general behavior was quite normal for a boy, and all gross motor activities held his interest. They had felt for a long time that he was a little bit clumsy, and could report that he had good use of hands except when it came to detailed activities. His father admitted that J. had difficulty throwing and catching a ball, and because of his clumsiness preferred to play with younger children.

There were several important clues in the developmental history. First of all, there was some doubt in the parents' minds regarding the inadequacy of early motor development, and they commented that they guessed he had always been clumsy. The first-grade teacher reported that J. was immature, and this suggested to the optometrist that there might have been some justifiable suspicion about his readiness for school. In further conference with the parents, they made the usual comment, "We do not understand why he has so much trouble in reading when he is smart about so many other things." Upon careful questioning, the optometrist discovered J.'s success in arithmetic occurred on number problems rather than reading problems.

Noting J.'s comments about his difficulty in reading unless he used a finger or marker, and noting also the variable retinoscopic reflexes, the examiner decided to investigate ocular motilities carefully. His performance on the dangled bell was characteristic of the youngster having difficulty in reading. His first fixation on the bell was slow-with both eyes making a stepwise reach for the bell. The ocular release from the bell to the examiner was immediate. The test was repeated three times, and as it was continued, fixation was slower and grasp less stable. Ocular pursuits showed freedom to the extremes, both right and left, without accompanying head movement. As this test was continued, however, the horizontal ocular movements became jerky. The vertical ocular pursuits were slightly better than the horizontal movements, although he needed to release eyes from the bell frequently. The ocular movements in the diagonal directions were completely stairstep in nature. When ocular movements in the horizontal were re-

peated, his eyes made one large jump from side to side.

Although this examiner usually questions the parents and the child about spelling abilities, this had not been done in the preliminary conference. As the examination progressed and ocular motilities became increasingly jerky, the examiner asked about spelling, and both parents and child commented that maybe spelling was worse than reading. Upon further questioning, the comment was made that J. usually had the right letters, but they were never in the right sequence. Although he was in sixth grade, J. was still reversing most of the words that can be reversed.

Although the basic problem apparently existed in oculomotor areas, further tests were used with J. as projective tests to determine the extent of his difficulty in visuoperceptual areas. J. was a bit self-conscious when asked to make a picture, but immediately drew a house. There was full freedom of right hand and arm movements, and his grip on the pencil showed no particular tension or tightness. His left hand supported the paper comfortably and easily. His drawing was very poor. His vertical lines were quite crooked, and his diagonal lines were irregular with no matching slopes. His drawing was a very poor representation of a house, and would have been more acceptable for a kindergarten or first-grade child. When he was asked to write his name on the page, his tensions were immediately observable and his writing was barely legible.

Visual forms were like his spontaneous drawing, and the lines had poor direction, unequal lengths, and were frequently overdrawn to complete the figures.

The simple form boards were easy for J., and his matchings and placements were done without trial and error placement. All judgments were visual judgments, and he made immediate use of both hands. His split forms were likewise well done, and he matched pieces, using both hands, before placing the finished forms in the proper positions. His key forms were more difficult, and although there were no obvious reversals, he would place the peg in the hole and then rotate it until it settled into place. J.'s method of placing the pegs might have been satisfactory to a casual observer, but his lack of judgment of direction prevented his aiming the peg before it contacted the board. This was further verification of the lack of directionality exhibited in his drawings. His performance on the size blocks definitely indicated a lack of visual appreciation for size. He did a lot of contact matching on this test and had considerable difficulty on the sequence of the sizes necessary to make a stairway.

J. had extreme difficulty on the tactual forms. He made no attempt to peek at what his hand was doing, but he could not discriminate the difference between the rectangle and the square, nor the proper position of the apex of the triangle. J. could not trace the groves with his fingertip in the counter-clockwise direction when asked to do so.

Here, then, is a boy, eleven years old, without the basic oculomotor skills so essential to the demands placed upon the visual mechanism by the reading task. Here was an inconsistency in skeletal areas that would not allow an adequate development in visceral areas for visual performance.* The inadequacies in directionality, visualization, and the processes of hand-eye coordination so essential to a child in the sixth grade were very evident. J. was attempting to read on the hand-eye level in a classroom where achievement was based on a visual level.

In the opinion of the optometrist to whom J. was brought by his parents, this boy was a nonachiever in academic levels. He had not fully developed all motor skills, but he had acquired gross motor patterns. J.'s breakdown came when he had to meet the demands of symbolic levels.

Next month we shall report the training procedures recommended for J. We suggest that the reader outline a training program for J. to compare with next month's paper.

*See the May, 1958, paper on "The Development of Binocularity," p. 57.

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

"DEVELOPMENTAL CARE AND GUIDANCE - II"

May - 1959

Series 3 No. 8

This series of papers is presenting an illustrative case of a boy, eleven years old, in the sixth grade. He would probably not have made the gains which were essential to his school success if lenses had been prescribed and no visual training had been done.

The case is typical of many of the children in our classrooms today. These youngsters have "normal eyes," 20/20 vision, and still have a critical developmental visual problem. The final paragraph of last month's paper suggested that the reader outline a course of visual training suitable for this case.

Following the examination, the optometrist discussed J.'s visual problems and illustrated the relationships between oculomotor skills and the demand placed upon the visual mechanism by the reading task. This has been a very difficult aspect of visual behavior to explain to parents. Parents can be shown that a youngster's eyes are slow and jerky and lack teaming in horizontal movements. On the other hand, if horizontal movements seem quite smooth, but vertical and diagonal ocular movements are erratic, it may be very important to discuss all aspects of oculomotor skill.

Parents will question comments made about the relationship between diagonal or vertical eye movements and the eye movements necessary to reading, and say, "But my child never reads in diagonal or vertical directions." Whether parents make this comment or not, every optometrist should suspect that it is in their minds and answer the question for them.

Parents will readily accept an explanation which logically states that freedom of movement in every direction is essential to skill of movement in a single direction. Parents also readily realize that a youngster cannot be free to comprehend the printed material if he has to make a conscious effort to keep eyes skeletally and viscerally set for the reading task. Most optometrists are familiar enough with gains in scholastic achievement which follow basic training to give reasonable explanations about the skills being discussed here.

Parenthetically, every optometrist should know about the work that is being done with children in the first three grades of the Lafayette (Indiana) School System. Children are being given activities in their classrooms to assist them in developing oculomotor skills. As a result of these activities, there has been a spectacular gain in academic achievement among these children. One teacher, in an experimental classroom, found that her group averaged nine months academic gain in three months calendar time. These procedures are now standard activities for every child in this system, in kindergarten, first, second, and third grades. The fact that the gains shown by these children have been validated and repeated by other teachers should be of interest to every parent. Optometrists can use the results of these studies to explain the importance of oculomotor skills in classroom tasks.

The inadequacies and inconsistencies in J.'s performance on the dangled bell readily account for his lack of more advanced visual skills. A child who cannot move his eyes, and who has not established a full awareness of ocular movement patterns, cannot be expected to have good sense of directionality. He may be able to voice north, south, east or west; right or left; and up or down; but unless he has had the experience of the movements which determine direction, he will not have adequate concepts for the symbols of direction.

"Thoughts that do not get into the muscles never fully occupy the mind." Although we do not know for sure who made this statement, it is an excellent expression of the developmental needs of all children. Every child should be made aware of his gross body movements as they relate to directionality. Gross motor routines, which we have borrowed from the Kraus-Weber studies, have been most effective in establishing motor patterns for children. These routines have assisted the child in developing an awareness of what eyes are doing through an underlying development of kinesthesis and proprioception in all movement patterns.

J.'s inability to visualize is also a byproduct of his lack of motor skill. Once again, the model of vision, so clearly described by Dr. A.M. Skeffington, makes it possible to understand how a lack of development in one area leaves gaps in other areas of perception. The information that J. has not received from motor experiences has deprived him of full experience in visual areas. His hand-eye behavior illustrates this. He could not translate hand movements into a visualization because he had not fully developed hand-eye coordination. His need for pointing and following the line of print while reading shows that he was still reverting to the hand stage in support of ocular movements. All of these behaviors were discussed with his parents, and because of the distance involved between his home and the optometrist's office, a home training program was laid out for him.

Because J. was eleven years old, it was not easy to recommend some of the routines because he might consider them too juvenile. Time was spent explaining these routines to him and the purpose of each. He was old enough to understand that he was clumsy because he had not learned full control in all motor areas. The Kraus-Weber series was presented to him as a method of improving his ball play and playground skills. This appealed to him, and he agreed to "do his exercises every day."

He was shown how to use a blackboard to improve his control of hand movements, and this was explained to him as a means of improving his writing. This he agreed to do because his teachers had frequently commented to him about his scribble. J. spontaneously commented that he thought he would like to do some of his homework on the chalkboard because he was sure it would be easier than paper work.

The usual routines of swinging ball, finger fixations, and near-to-far fixations were given to J. and explained to him as being very important because they would help his reading. J. was carefully told that he would have to do more than these exercises to improve his reading, and that the recommendations being made were not a "cure" for his difficulty in reading.

His parents were told of the many things they could do to assist J. in finding out that reading could be informative and fun. A personal experience reader method was explained to them. They were told that this method would be outlined for J. as soon as his oculomotor skills showed the improvements essential to reading readiness.

These were the only recommendations made at this time. J. had been given so much remedial work in his first years at school it was important not to overload him. The three major areas of activity for him included the gross motor exercises, the chalkboard routines, and the specific oculomotor procedures. The parents were told that they should not elaborate upon these procedures until they observed some gains in each routine.

The examination, (as outlines here) the conference with the parents, and the explanation of procedures consumed approximately 1 1/2 hours of office time. J. and his parents were dismissed after being told that they would receive a typewritten report. This would be a review of the conference discussion. The report which was sent to them is as follows:

"The examination records on J. are now complete. His performances on each test have been reviewed so this summary report can be written for you. I wish it to reach you as soon as possible so J. can have immediate assistance. As you were told during the conference on Monday morning, it is my opinion that J. is the victim of an educational system designed for the majority. As such, it did not provide him

with methods of learning which were suited to his individual needs. I see many youngsters who have shown abilities to learn and gain general knowledge, but who have not acquired the specific abilities required in reading and spelling. Research and study of these children and their problems now give some reasons for their difficulty in academic areas.

We know now <u>how children learn</u>, and can adequately investigate the abilities a child does possess. Therefore, individual programs can be designed to meet the needs of each child so he can, in turn, meet the demands of the classroom. To lay out such a program of assistance, it is important to recognize the abilities a child has so his guidance can be started in the areas where skill and ability now exist. We cannot drill, drill, drill in subject matter which a child such as J. does not comprehend and expect satisfactory results. Being aware of his difficulty in these unaccomplished subjects, J. will feel more and more defeated and incapable when the emphasis is so placed.

"Our tests, therefore, were of visual and perceptual skills basic to and directly related to reading readiness. You will recall the care to avoid making any reading tests. This was done for several reasons: 1) I am an optometrist interested in and trained to recognize the visual abilities necessary for achievement in every phase of learning; 2) reading tests must be given by teachers who are trained to administer them; and 3) with his difficulties, know in advance it was more important to investigate the underlying problems in visual and perceptual development.

"I wish to repeat the three primary reasons for J.'s problems in reading, as found in his performance on the tests here in the office. First, no doubt he did start to school too early, but this is only a part of the reason for his early lack of readiness. All of the tests indicate that his preschool development was somewhat incomplete, and there were inadequate skills in motor (muscle control) systems. You will recall my comments about whether or not he did any all-fours creeping in babyhood. Characteristically, it is found that if this infant activity is omitted, children do not get the necessary experiences so essential to a full awareness of their two sides and the interrelatedness of these two sides in total action and movement.

"It is also characteristic of these children that their own concepts of 'right' and 'left' are incomplete. Thus, the knowledge of left to right directions, so essential to all school and cultural achievements, is not fully acquired by the child. J., like so many children, shows reversals and inconsistencies in his judgments of directionality. The full understanding of 'left to right' must be gained by J. in every situation and activity - other than reading - before it will be a consistent performance in reading. This awareness of left to right is only one direction which must be acquired, and it must come from a further development of kinesthesis (muscle senses) if he is to acquire the full meaning of where to start, which way to move, and when to stop.

"Even if he had started to school a full year later, the mere increase in age would not overcome the lack of motor skills. Time alone does not bring these abilities. We have evidence of this in the fact that he did repeat a grade, which gave him another year in time. Research now being conducted in primary grades shows that calendar age is not as significant as the levels of motor skill acquired by each child. I feel that delaying school entrance gives more children the chance to be ready, but this delay does not guarantee individual readiness. I see many children who are receiving preschool developmental training under my guidance who will be ready for school regardless of their calendar age. If we could turn the clock back, we could do these same things for J. Since we cannot go back to ages three and four, we must assure him of these achievements before any more time passes.

"You will note the enclosed booklet, HOW TO DEVELOP YOUR CHILD'S INTELLIGENCE, with the visual training routines. Please read it through at your earliest opportunity. You will find that I have check-

ed particular routines for J.* The first of these are routines which will help him to build the kinesthetic awareness he needs. These will seem very simple to him, but I am confident that he will find them a bit difficult when he strives for balance and coordination.

"Second, a major part of his problem in reading and spelling lies in his lack of eye movement control. Eyes must move smoothly and freely if they are to maintain 'contact' with the task at hand - whether it be reading or any other visually centered task. Eyes can only operate as sensory receptors (information receivers) when they can stay on the job efficiently and continuously. Every time they lose contact, the train of comprehension is lost or muddled. Here again, the research on primary school children shows - almost without exception - that children who do not have this eye control are in the lowest reading groups, and those who do have it are in the upper middle or highest reading groups. This ocular control is essential to skill in reading.

"J. shows a lack of teaming of the two eyes, and the definite lack of continuous or maintained teaming. He loses control as he stays at the reading task, and would be expected to miscall words, reread the same words, lose his place, and then lose comprehension of the material under these circumstances. I want to avoid over-optimism, but feel he can show immediate gains in this area with daily practice on the routines enclosed for the development of eye movements. J.'s case is rather typical of the youngster who reads better on first and second sentences than he does on the last sentence in a paragraph. More jerkiness and further loss of teaming were observed as we insisted he continue to keep eyes moving as the little bell moved.

"It is important to emphasize to J. (as I did in my final conversation with him) that these routines of swinging ball, finger jumps, and near to far fixations are really activities for his own benefit If he just 'goes through the motions' in doing these routines, no real gain can be expected. He must make the effort of keeing eyes on the ball and in making the attempts to improve. This is the old business of 'applying himself,' and I'm sure he will. I feel he is the sort of youngster who does try to the best of his ability.

"Third, J. shows the usual situation of the youngster who never quite found out that the words on paper are supposed to represent the world around him - <u>and his activities in it</u>. These youngsters are fully alert to, and aware of, all the real things around them, but have not shifted gears for the interpretation of abstract symbols for these things. These children usually have a better speaking vocabulary than reading vocabulary, and are the ones who puzzle many adults who give reading tests because of the inconsistencies in the test results. Low scores on some parts of the test, and high scores on other parts, are usually related to the degree of abstract symbolism (printed words versus conversational words) demanded in the test sequence.

"There is still another factor that affect the variation in test scores. Some youngsters are 'idea readers' instead of 'content readers.' These are frequently the children who do much better on silent reading than they do on oral reading tests. They can get the general idea of the material when reading to themselves and verbally repeat the gist of the story - they get the 'idea' of the story. When they have to read aloud, their errors are obvious to the listener, and the details are missed because of the confusion which arises over simple and reversible words (was - saw, on - no, etc.), while having to say the words as well as read them. The 'idea readers' can provide many of the details of a story, when questioned about it, out of their own experiences, reasoning, and logic. Their children, much like J., are basically smart enough to use thei

* The routines checked for J. were the basic exercise procedures and the basic chalkboard routines as described in the booklet mentioned. All of the routines are familiar to optometrists attending Congresses and Workshops.

general background of knowledge to fill in these details and, guessing can be correct more than half the time.

"To overcome this problem, a youngster needs much practice in the visual discrimination of likes and differences, size and shape, etc., in order that he can learn to perceive the significant details quickly and correctly. Further, he needs reading material which is of more personal interest, more realistic, and which matches his own experiences. In this fashion he can find, and check, in his own memory and experiences, what the difference is between there and their, on and no, etc. This is why I wish J. to have the experience-readers we discussed here in the office. This routine will be given you as soon as J. is ready for it. I have also checked routines in the booklet to elaborate and extend these skills of visual perception.

"You will also recall our discussion of J.'s need for glasses related to schoolwork. I shall write to Dr. B. relative to this prescription, but I wish to repeat the reasons for the type of lens which will be prescribed for J.

"As soon as J. has gained some control of eye movements, and the teaming of eyes is improved, he should have lenses that he will wear in all schoolwork. He needs lens help at near distances only, because all visual tests at near-point showed unstable and inadequate focusing ability. You will recall that here in this office most of the tests of visual functioning were made at near distances. Most non-optometric 'eye examinations' consider a patient's ability to see a wall chart clearly at 20 feet. Optometric tests consider the efficiency and status of visual abilities at all distances, but especially at near distances, because this is where the greatest part of the visual load exists in reading, writing, and arithmetic - the school load.

"Because J. needs help at near to maintain this load, we shall undoubtedly start him in double lenses - bifocals - not because he is 'forty years old,' but because he needs assistance on his job as a student and does not need lens help at distance. This type of lens will allow him to look up from a book and see clearly and easily. When he looks back at a book or his desk work, he immediately has the lens assistance he needs. J.'s eyes are perfectly healthy and normal in structure; they need lens help for more efficient performance instead of correction for any defect. This is the case in over 80 per cent of all the children seen by optometrists.

"I wish to comment briefly about J.'s future as a student. As I stated earlier, J. is the victim of a mass education system, rather than his own incapabilities. I am confident the assistance he can be given by all of us interested in his problem, can bring him up to a much higher level of academic achievement. We must realize that he has lost time and some of his interest because of his difficulties in the past six years of school. However, I feel he has not lost his desire to achieve, and if we assist him in every possible manner now that we know his problem, I am sure he can make very satisfactory gains. As the basic visual skills and readinesses are achieved by him, we shall probably see him applying these abilities to school subject matter and school related tasks. We can be quite sure that following our very careful examination, he has many of the essential visual and perceptual abilities he needs for reading. He needs help in finding what printed words are - their purpose and how to use them. This, I am sure, he can acquire with the help and the program outlined for him.

"It was a pleasure to see and to work with J. If I could do just as I wish, and if adults didn't need help too, I would devote all of my time and efforts to youngsters just like J. There are lots of them who need this same sort of help.

"Please do not hesitate to write or to call me if you have any questions which the conference or this summary leaves unanswered. I am sending a copy of the examination findings and this report to Dr. B. He will be of great help to you and to J. as progress is made. I should like to see J. again in six or eight weeks, and you will be sent an appointment notice at that time.

"Give J. my greetings and my personal thanks go to you for such splendid parent cooperation."

The specific oculomotor training routines for J. are as follows:

"Rx. A. Swinging Ball

Put a string through a rubber ball (about 2 inches in diameter) so the ball can be hung from a light fixture or doorway.

1. Have the ball at about J.'s eye level when he stands facing it. Swing the ball gently to and from him and instruct him to watch it, as it comes and goes, two to four minutes.

2. Swing it side to side and again instruct him to watch it as it swings back and forth, two to four minutes.

3. Hang the ball about 3 feet off the floor. Have J. lie on his back directly under it. Now swing it in a rather large circle and instruct him to watch it until it comes almost to a stop.

These routines provide practice in eye movements which compare with the use of eyes for reading activities. Following the ball gives the same ocular action as that required on moving eyes across lines of print in readers and workbooks. As eyes move more smoothly in this ball routine, they can then move across pages with more skill and efficiency.

"Rx. B. Finger Fixation Movements

Hold right and left forefingers erect, about 12-14 inches apart and about 12 inches in front of eyes. Have J. look quickly from left to right, to left, to right forefinger, etc. Move eyes as quickly as possible, but be sure both eyes 'land' on his finger tip each time. Work to achieve speed and smoothness of the 'jump' between fingers, and immediate 'landings' of both eyes.

This practice is similar to the action of eyes that is necessary in leaving one line of print and picking up the next. It provides practice in moving eyes across the pages of workbook material where quick accurate visual fixations are necessary for finding the correct, or matching, iter of information. It is also an important visual ability for copying from a textbook or reference book.

"Rx. C. Near-Far Fixation

Have J. hold a pencil erect about 10-12 inches in front of nose. Look from pencil to numbers on a calendar as quickly as possible until both are clear and single. Now look at pencil, then to numbers on calendar, repeating until he has made 10 - 15 'round trips.' Be sure that he sees both targets clearly and quickly. As this becomes easier, move pencil closer to nose and repeat.

This routine gives practice in two areas of visual performance. It improves the ability to shift eyes quickly from the chalkboard to the work sheet on desk, or from textbook to teacher, and back to book. It also improves the speed of eye movements across the distances involved in classroom activities.

"These routines are of utmost importance to J.'s future use and maintenance of two eyes as an efficient pair. We shall continue our examinations and observations on progress report appointments and make further recommendations for him. The combination of his attempts to improve and our guidance can enhance J.'s visual welfare, and his ability to achieve in the visual tasks of the classroom. When one stops to consider the load placed on a child's eyes and his vision, by the classroom tasks, one can realize the need for practice in these visual abilities which are so essential to a child's success in school."

A three months progress report appointment was set for J., and the results of this second examination will be given in next month's paper.

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

"DEVELOPMENTAL CARE AND GUIDANCE - III"

June - 1959 Series 3 No. 9

The report that was written to J.'s parents placed particular emphasis upon his need for achievement lenses. During the first office conference with the parents, they were told that the optometrist in their home town, who had made the referral, would receive full information on J.'s case. They were to see the optometrist before too much time had gone by, and as soon as J. had gained some of the basic oculomotor skills, their local optometrist would prescribe the proper lenses. A copy of the report and all examination findings were sent to the optometrist. This report follows:

"Dear Doctor B:

"As you know, we were able to move J. M. into our appointment schedule last Monday, and ran a very complete examination and investigation of visual perceptual skills. Enclosed is a copy of the report written for his parents, together with a copy of the visual analysis. The report is quite self-explanatory, but I wanted to discuss the visual findings with you.

"You will note considerable instability throughout the visual findings, with left eye consistently more inadequate than right eye. You will also note the occurrence of minus cylinder, axis 90, on near retinoscope and on subjective. As you will see, J. needs some lens help, especially at near-point. Since his basic ocular motility skills are so lacking, he should have very definite assistance in gaining motility before lenses are prescribed for him. The lens will be more acceptable and he will get more assistance from it when these basic kinks are eliminated.

I should like you to see him in a couple of weeks to check on the basic ocular motilities and on the visual findings. Often in this type of problem, the cylinder will disappear, and there will be a better balance between eyes on all tests. I should expect J. to accept a plano or maybe +.25 for distance with about a +.75 add. You may feel that a little more plus is acceptable at near when there is some improvements in basic skills. Of course, I leave this to your judgment.

Also enclosed is a copy of the basic visual routines, which I have asked Mr. and Mrs. M. to use for J. They are being sent a copy of the booklet, "How to Develop Your Child's Intelligence," with a number of special routines checked for J., so that his perceptual training can be carried on at every possible opportunity.

"J. is a very interesting youngster, and I feel sure he can be assisted. In fact, there is the urge to say that J. can be "saved." He's a sharp lad and has not lost his desire to achieve in school. With his basic capabilities and the desire that he demonstrated here throughout the test examination, we might well see some very splendid gains.

"Thank you for referring J. I shall keep in close touch with you. It was a pleasure to work with him, and to confer with his parents. If all parents of children were as sincere as the M,'s, every day could be as bright as last Monday. Should you have any questions on the examination, do not hesitate to drop me a note. If you would like to review the rest of the examination findings, the record will be sent to you."

For some reason, perhaps through a misunderstanding, the optometrist did not see J., and the glasses were not given. J. was seen again in three months' time by the developmental optometrist for his first complete progress case study follow-

ing the home training routines.

There were a number of changes noted, and the boy's report of his own gains was very significant. J. stated, "I think there is quite a difference in my reading. I don't skip around as much, and I can read better. I do not lose my place as much either, and I know I'm doing less re-reading. My eyes do not get nearly as tired at school. Sometimes on the swinging ball my eyes get real tired, but I can do it better than I used to. I don't hold my book as close as I used to either."

J.'s parents reported that for the first time in his life he is doing some spontaneous reading. Most of this reading is comic books, but they were amazed to see him spend time reading the words in the balloons. Previously, he had just looked at the pictures.

Very careful observations were made of J.'s ocular motilities, and the dangled bell test showed much more adequate eye movements. J. could now maintain fixation almost to the end of his nose, and release was immediate and binocularly smooth. His left eye was a little slow on refixation when the bell was held at a distance of about three inches. He showed full motility of eyes in the horizontal meridian with no accompanying head movements. The only eye jerkiness noted was at the extreme ends of the horizontal sweep. Vertical ocular pursuits were smooth, and he could maintain grasp. The ocular movements in the diagonal directions were no longer stair-step in nature, and he could maintain all ocular movements for as long as requested of him.

His unaided acuities at distance were 20/15 each eye and both eyes. His near-point acuities were all 20/20, with none of the jerkiness noted on the original examination.

His Analytical findings are as follows:

#3.	2 eso.	
#13A.	4 eso.	
#4.	O.D. +.50	
	O.S. +.75	(Both reflexes stable and no meridional differences. The previous examination showed an unstable reflex with slight meridional differences).
#5.	+1.50 O.U.	(Both stable, no meridional difference until J. was pressed for detailed descriptions when a very scant -.25 x 90 was observable.)
#7.	+.50 O.U.	(Discriminations were immediate to 20/20 each eye and 20/15 O.U. The cylinder which showed on original examination was completely rejected.)
#8.	2 eso.	
#9.	6	
#10.	17/9 Smaller. Away.	
#11.	4/-2	
#13B.	1 eso.	
#14A.	+1.50 Sphere O.U.	(Response was slightly variable, but dependable. No confusion.)
#15A.	7 exo.	
#14B.	+1.25 Sphere O.U.	(Very definite.)
#15B.	3 exo.	
#16A.	16	
#16B.	28/8 Smaller. Away.	
#17A.	8	
#17B.	22/12 Smaller. Away.	
#19.	O.D. 3.50, O.S. 3.50, O.U. 3.50	
#20.	-1.75	(Definite)
#21.	+1.75	(Definite)

All near-point findings were taken through a +.75 sphere. J. reported no fatigue or discomfort following the examination. When questioned, he said, "My eyes feel fine."

The important change in J.'s responses

during the second examination is the stability which was not present on the original visit. The disappearance of the minus cylinder axis 90 is quite important, because here again is the evidence that the meridional difference was related to his original problem in teaming. There was no doubt in the examiner's mind that proper lenses would now be more effective than they would have been in the original situation. J. was dismissed, and a phone call was made to the optometrist in his home town to assure that the boy would be given the lens help now important to his school work.

J. was given a +.25 O.U. with +.75 add O.U. in a wide seg bifocal, and was seen again two months later. All Analytical findings showed more stability, with more of the expected amounts of plus in retinoscope findings. Blurs, breaks and recoveries were all higher, although the case was still a B2 type, as was indicated on second examination. J. reported that school was going along well. Reading was improving because he could read more smoothly. He no longer lost his place, nor did he need to use his finger or a marker. When asked what he thought of his glasses he said, "I think they're okay. I can sure see better with them on." He said he was never reminded about where he should hold his book.

His parents reported that his reading was not improving as much as they had hoped. They admitted that they had not done as much home work with him as they should have done. They felt he was still having trouble retaining words, and thought he should have further help in learning how to attack words phonetically. The visualization methods which had been recommended for J. had given him considerable help, but his parents felt that his basic reading problem was so deep seated, because of his failures in early grades, that something should be done about phonics. The parents expressed their surprise over how well J. wore and used his glasses. They reported that the teacher was more surprised than anyone else. The teacher had also reported to them that J. was doing much better in school, but his underlying reading problem was still getting in the way of greater achievement.

The developmental optometrist made two recommendations. First, the parents should find someone to tutor J. in basic reading skills and basic phonics. Second, they were now urged to use the experience reader technique, which would assist J. to make up his own reading lessons.

This experience reader method has been very valuable in assisting children of all ages to achieve more adequate symbolic skill. It has been used most frequently with primary grade children, but has also been found very effective with older youngsters like J. Many first and second grade children report that they do not like reading. Careful questioning of these children has brought out a very frequent and surprisingly universal reason for the dislike they have expressed. Their comments, "My dog's name is not 'Spot,'" or "I don't know anyone named Dick and Jane," very significantly indicate that the stories they have in first and second grade readers are not related to their own background of experience.

Many excellent teachers have attempted to counteract this strange and unrealistic material with group participation in daily experience reading exercise. The teacher will ask what day it is; several of the children will answer, and while "This is Tuesday" is being put on the chalkboard, the rest of the class is probably still wondering, "What difference does it make what day it is?" This should not be interpreted as condemnation of the experience reader technique. The question being raised here concerns its value as a group activity, where clinical practice has shown its greater value as an individual activity. Just because several children in a classroom are capable of telling what day it might be does not mean that the rest of the children in the room have had a background into which this bit of information can be fitted.

In spite of this criticism, which is sincerely meant to be analytical and constructive, teachers should not discontinue this part of their classroom procedure. Parents should recognize that the experience reader can also be used by them to supplement the classroom activity, and at the same time encourage their child's interest and curiosity in the written word. The use of this procedure applied to their own child's experiences and events of his

individual day helps him to realize the value of writing and reading as important means of communication.

A detailed analysis of having a child write short sentences about his own experiences gives insight to the reasons why so many children have profited when parents used this method of helping their child learn to read:

a) The memories and visualizations of the events of the day about which he talks let him practice recall and the organization of the sequence of the day's occurrences.

b) The language he uses, and his choice of words out of his own vocabulary, let him explore the words most meaningful to him.

c) The places, people and things he puts into his story are all very realistic to him--unless he goes into flights of fancy which parents will immediately recognize. If this does occur, a bit of steering will bring the child back to reality.

d) The dictation (or writing) of these words, and his memory of the account, will assist a child to visually recognize the words when he reads the sentences.

e) The procedure will help a child to realize that "readin' is just talkin' wrote down." When a child realizes, as he will have, that he is "readin' his own talkin'," he is usually very pleased over the fact that he can "see" his own words. Parents have frequently reported that their child was so fascinated by these words out of his own mouth that reading sessions ceased to be the dreaded chore, and were demanded by the child. Many a child has changed by this method, from being the poorest reader in their class to one of the best readers in the group.

The following instructions to parents have proven to be effective with most children:

1. Have your child dictate to you, in his own words, short sentence accounts of his day. This is best done when he comes in from school, or before the evening meal. If possible, type it out for him. If a typewriter is not available, print it, or write it in the same sort of letters used by his teacher at school.

2. Have him read it back to you immediately while it is fresh in his mind. Help him with the words he stumbles on; discuss the words and the event or item being described so that his concept of the words is complete.

3. Put this paper into a notebook and lay it away until evening. Have him again read it before going to bed.

4. Repeat this activity each day, adding each new page to the notebook. Have your child reread and review previously written pages, and urge him to increase the length of his stories as his vocabulary and word recognition skills increase. Help him to increase his accuracy of word usage as his skills increase, but do not be too demanding until after your child finds out that this activity can be fun as well as instructive.

5. As the stories increase in length, decrease the number of pages for review. When the stories become more complete and your child becomes more fluent in his account, encourage him to start writing part of the story himself. This can be done by having him write some of the sentences, or leave space for him to fill with words he is capable of writing.

6. As your child gains facility in writing, utilize the chalkboard as much as possible for word practice. The skills of full arm movements developed by previous chalkboard routines will be apparent in your child's writing.

The application of this procedure, carried through to the stages where a child shows the acquisition of word recognition abilities, will prove to be a most helpful routine for almost every child. Even though a child may appear to be a "good reader," it is very possible that he is, in reality a "good word caller" without the full understanding and comprehension so essential in

later grades. Parents should use this routine to assure themselves that their children are projecting themselves into their reading and participating in the stories as if they were experiencing the events. Only when children do participate in this manner will the context of printed material be completely useful to the child in building his store of knowledge and information.

J. was seen again at the end of summer vacation. He had had some tutoring early in the summer months, and his parents were pleased with his progress. J. reported spontaneously that his work in reading went very well, and when asked why he thought so, he said, "It just seems that reading goes better and is more fun now."

All oculomotor skills were now fluid, and fixation, release, and grasp much more definite. His Analytical examination showed much more freedom, with lenses very adequate for his needs. Although he had not worn glasses generally during the summer months, he always put them on for reading, and his parents were particularly pleased to find him more interested in books. He was now visiting the library. His mother expressed concern over his handwriting and the difficulty still remaining in spelling. The parents were urged to have J. use his chalkboard for word practice and to continue all possible routines for the further development of visualization.

J. passed from sixth to seventh grade without the usual "On Condition." He was pleased with his achievement, and reported that school was not so bad after all.

Communications from J.'s parents during his seventh grade year stated that his work in seventh grade was very satisfactory. J. was not in the top 1/3 of the group, but was doing so much better than he had in any previous year that his parents were very happy with the over-all rise in academic achievement.

J. is typical of the many, many patients seen by optometrists. He is also typical of the child who has been hindered throughout his school life by a lack of the developmental skills so essential to visual performance.

If we in optometry are to consider vision as a part of the total organism, we must constantly recognize that the visual mechanism can be no better than the machinery which supports it.

J. could have been fitted refractively, and would undoubtedly have received some assistance from lenses. The chances are excellent that one of two possibilities would have occurred. First, he would have become a progressive astigmope with only a slight gain in visual achievement. Second, somewhere along the line he would have said, "I've had it--I want no more of school." The end result of this attitude cannot be predicted, but we know that these are the youngsters who usually get their names in the paper or quit school. Either way, they are wasted individuals.

The papers to follow will consider similar cases but special attention will be given to the individual differences which determine the course every optometrist should take in assisting his patients in reaching the goals within their abilities.

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

DEVELOPMENTAL CARE AND GUIDANCE - IV

July - 1959

Series 3 No. 10

Included with this month's paper is the first section of a Developmental Profile for determining visual performance levels. This is printed on a separate page so you may lay it beside the rest of the paper for immediate reference. The second half of this Profile will come to you in the August paper.

In the intervening month it is suggested that you make frequent reference to this Profile and plot each child's examination on it. You will find it of great assistance in diagnosis and prognosis.

The June paper concluded by stating cases similar to those just presented would be considered. Emphasis was placed upon the individual differences which can determine the course every optometrist should take to assist each patient in reaching the goal within his individual abilities. The June paper was written several months ago, and since that time a number of events have occurred which demand that the context of this series be changed. This change will not alter the goal of presenting a consideration of individual differences. It merely changes the method of presentation to make it of more assistance to each member of the Optometric Extension Program than continuing with exemplary cases.

Dr. R. W. Knight of Morgantown, W. Va., has been of great assistance in the organization and presentation of the developmental vision concepts. Dr. W. R. Henry of Warrensburg, Mo., and Dr. Homer Hendrickson of Temple City, Calif., completed the team that has made it possible to organize the philosophy to the advantage of all who attended the classes at Purdue University. This team has been attempting to produce a working outline which would provide diagnostic and guidance syndromes. About five months ago Dr. Knight came up with an idea for a developmental profile for determining visual performance levels. This profile has been revised and reworded several times since Dr. Knight's first outline was received. His basic idea has been retained, because his profile expresses the sequence and interweaving of all the organismic processes that produce visual performance.

The developmental profile, which has resulted from Dr. Knight's original outline has been used at a major congress and at several seminars. Thus, it has been "kitchen tested" before groups of optometrists and educators, and has been found to be a very valid method of presenting the concepts held personally. Those who attended these meetings and who have been using this profile report they can analyze each case on the basis of the individual's developmental progression, as expressed by the profile. These men are also reporting that they are now able to recognize the individual's needs in programming guidance and training as a result of the profile. It has been most important to develop guideposts for the determination of training which are as effective as the guideposts in diagnosis. This developmental profile for determining visual performance levels answers both needs.

This profile has two major sections. The first section deals with the individual's freedom to move. Optometry is well aware of the importance of mobility in the ocular mechanism. Recent years have brought

an awareness of the importance of mobility in the total organism as it relates to visual performance. This series of papers has constantly stressed the significance of adequate motor patterns in every area of human performance and has frequently referred to the relationship between body movements and ocular movements. This series very early discussed the essential characteristics of gross motor patterns, the reciprocal interweaving of the two sides, eye-hand relationships, and the ocular dynamics and visual consistencies which would result when all these motor patterns were adequately established. Note that each of these performance areas is presented in this first major section of the profile. Each of these will be discussed.

There is one column on the profile which is very important in practice. This is the left-hand column of the first section, titled "Levels of Achievement." Over the past fifteen years, working with and watching many children move from infancy into the primary grades, we have seen them progress through these four levels of achievement. It is important to realize that each level is descriptive of longitudinal development, as well as diagnostic levels at the moment the child is being examined. Each box in this column contains several terms descriptive of performance levels. Note also that each of the boxes is numbered with #1 at the bottom, and #4 at the top. The purpose of these numbers will become clearer later in the discussion. These numbers represent the sequence of progression through time, through development, or through the acquisition of skill. Thus, the #1 represents an early age, or the minimum of development or the minimum acquisition of skill. The #4 represents a later age or the maximum in development and acquisition of skill.

This series previously discussed achievement, but it is important to review some of the interpretations frequently given to the word achievement. Optometry gives it a slightly different meaning than educators do. Psychologists give it another meaning. Those who deal with retarded or slow learning children give it still another meaning. No one has come up with a definition that is acceptable to all of these disciplines. This column on the profile contains descriptive terms intended to describe the levels of achievement in line with each discipline's definition. On the basis of individual growth the #1 represents the period of infancy; the #2 represents the early preschool years; the #3 represents the late preschool and kindergarten years; and the #4 represents the grade school years.

From the viewpoint of academic achievement the #1 represents an unacceptable level of school performance. This would be typical of the child in second or third grade who is only capable of kindergarten achievement. The numbers two, three, and four, represent lowest, middle, or upper third position in a grade group.

If the retarded child is being considered, the #1 represents the extreme slow learner who will probably be classified as trainable to some degree. The #2 represents the youngster who is trainable to a degree of self-sufficiency. The #3 represents the child who would be classified as educable in minimal academic areas. The truly retarded child will seldom reach that level represented by #4.

From the optometric viewpoint in considering visual abilities, the #1 level is one of complete inadequacy. This indicates that the individual has not achieved vision as defined by Dr. Skeffington and is still operating in the mechanics of sight. The #2 represents a sub-adequate level of performance. At this level the individual is beginning to integrate more than the sight mechanism but would not be capable of achieving more than would be expected of the young preschool child. The #3 represents the level of minimum adequacy. This individual would do well in the preschool or kindergarten demands, or if he were older, would be described as the child who does well in everything except school. The #4 obviously represents the ultimate in visual development. This is the level that most youngsters never reach without guidance and assistance. This is the level characteristic of the obviously superior child and can be more adequately given to children through visual training and the optometric philosophies of visual development.

This profile must be used as a sliding

scale. It cannot be said that every youngster in the grade school years is completely educable to superior levels and will obtain the ultimate in visual development. All that can ever be done is to examine each child to find what skills he has obtained and then make every possible effort to assist him to acquire new and more adequate skills.
In viewing the profile and its horizontal columns, it must be realized that each of the numbered boxes in the left-hand vertical column can be diagnostically significant. If, for example, a child is in grade school, his growth sequence would indicate that he should be on the #4 level. He may show gross motor patterns indicating skill and integration. When the reciprocity of organismic halves is considered, it may be found that he has only attained the #3 level of achievement. From observations of hand relationships it may be found that he is somewhere between level #2 and level #3. As tests of ocular dynamics and visual consistency are made, the analysis of his behavior would indicate that he has only achieved the #2 level. Here, then, is a profile indicating an adequate level of motor skill for his age with an unacceptable level of ocular skill. From a visual development standpoint it can immediately be recognized that this child is not adequate to the visual tasks of the classroom, and must have visual training if he is to succeed in academic tasks. Lenses alone, no matter how necessary, will not allow this child to reach satisfactory academic achievement levels.

There has been a lot of discussion the past few years about the consistency of visual input. It must now be recognized that visual consistency is an end result of adequate development of the skills which underlie a freedom to move. As a rule, a strict lens case would be judged adequate in all underlying processes.

Until recently little or no thought was given to these. With this developmental profile it is possible to differentiate between the cases where a prescription is all that is necessary and where the lens prescription must be supplemented with a training program. Often it has been noted with surprise that a simple +.50 lens raised a report card from C's to A's. Likewise, it has been observed with chagrin that +2.50 had no effect on academic status.

As the importance of the processes which contribute to visual consistency is realized, it can be seen why some lens powers bring about immediate and significant change in a child's performance and behavior. Looking again at the profile, a youngster might fit into level #4 in the first three columns and drop to level #3 or even #2 in column D and E. Difficulty would be expected in consistency of visual input because of the difficulty in ocular dynamics. Likewise, difficulty would be expected in ocular dynamics because of the difficulty in visual consistency. Proper lens prescription in a case like this could bring about rather spectacular results in the demands of the nearpoint task, and his classroom performance would bounce to higher levels almost overnight.

To make this profile chart most useful a review of diagnostic techniques is in order. Each of the vertical columns in this first section of the profile can be related to every test now made by functional optometrists. This series has frequently stated that observations of a child's visual development should start the moment he walks into the reception room. Actually, it is important that these first observations concern the manner in which a child walks and his gross motor development. One can be cued to look for the presence or absence of motor patterning by the information given on the Parent Interview Form, which so many optometrists are using. The manner in which the child moves to the examining room, his ability to hop or skip, and the manner in which he climbs into the examining chair all give valuable clues to his performance level in gross motor patterns and reciprocity of organismic halves (column A and column B).

The Dangled Bell test will give information of each level in each process designated on this section of the profile. For example, if pursuits are very limited or erratic with much head movement, it would be suspected that the individual has only achieved level #2 or level #3 in column A. If one eye drifts or lags or either eye pursues only on its own side, that individual is suspected of having no visual development above level #2 in column B. If the indi-

vidual can only fixate the bell when hand comes in to support the fixation, eye-hand relationships (column C) are present, but no visual skill has been attained. If the individual can momentarily fixate the bell but cannot maintain grasp, he is suspected of being in one of the lower levels of ocular dynamics (column D). It would seem to be quite obvious that there would be little or no visual consistency if the individual uses one or the other eye and is unable to use both receptors simultaneously to fixate the bell. The performances just described would all indicate inadequacies in total skeletal organization as it relates to visual development.

The retinoscope will give many clues by which the patient can be profiled in determining a visual performance level. Although it is not a direct clue to organismic gross motor patterns, an inadequacy of motor skill can certainly be suspected when there is a variable and extremely unstable reflex. If there is a dulling and brightening of one eye or an alternate dulling and brightening, the degree of reciprocity of organismic halves is in doubt. If hand contact on the target during retinoscopic observations supports brightness and stability of the reflex, it would be concluded that some eye-hand relationship was established, but that skills had not been developed much above level #2 in column C. If the individual shows a bright retinoscopic reflex on first inspection of a target, but it dulls off and becomes unstable as he continues to inspect, it would be safe to assume that level #1 or level #2 would be the limits of his visual development in ocular dynamics. This same observation would give an immediate clue to the consistency of visual performance.

Each test discussed in this series can be fitted into this profile just as was done here with dangled bell and retinoscope. To make this profile most effective and most useful in office procedures, consider each of the tests you make as it relates to this profile. Every Analytical finding can be analyzed, and every performance on the visual ability series can be related in the same fashion.

Next month the second half of the profile will be briefly discussed. There will then be consideration of the guidance and training which will assist every patient to move up a level or two in every area and process of visual performance.

DEVELOPMENTAL PROFILE FOR DETERMINING VISUAL PERFORMANCE LEVELS

FREEDOM TO MOVE

LEVELS OF ACHIEVEMENT					
Visual Development Growth Academic Retardation	(A) Organismic Gross Motor Patterns	(B) Reciprocity of Organismic Halves	(C) Eye-Hand Relationships	(D) Ocular Dynamics	(E) Visual Consistency
(4) Ultimate Grade School Superior Educable +	Motor skill and integration of movement patterns	Ambilateral. Complete reciprocal interweaving. Total action system (grace and poise)	Optimum. Visual lead and control Vision leads. Hands are subservient.	Optimum reach, grasp and release in movement.	Binocular. Equal participation of each end organ. Consistent input from both receptors.
(3) Adequate Preschool Kindergarten Middle Third Educable -	Trunk with upper extremities. Very awkward with lower extremities. Gross hand skills, no dexterity.	Bi-lateral. Strong preference for a leading or dominant side. Aware of midline. Off-side supports and reinforces.	Eye-Hand. Visual dominance but maintains with hand support. Hands used to reinforce and verify.	Adequate reach and grasp. Breaks down on release or on pursuit under stress. Loses teaming.	Binocular-Bi-Ocular. Primarily binocular but breaks down to bi-ocular under stress. Suspends or suppresses. Loses central fusion.
(2) Sub-Adequate Early Preschool Lowest Third Trainable +	Trunk controls only. Movement of head, shoulders only. All extremities disjunctive. Palmar hand. Anti-gravity movements only.	Lateral. Uses either side without discrimination. Definite midline. Can't cross midline for reinforcement.	Hand-Eye. Hand dominance vision follows. Vision observes but does not participate.	Has reach only. Cannot maintain grasp. Release all break down in movement. (up-periscope)	Bi-ocular. Uses one or the other, but does not use both receptors simultaneously. Alternate, visceral or skeletal.
(1) Not Adequate Infancy Unacceptable Trainable	Little or no pattering of movements. Random and erratic.	Unilateral. One-sided actions. Off-side follows, does not support. May hinder.	Hand only. Hand activity with little or no visual component.	No visual reach, grasp or release. No ocular pursuit, no stability in oculo-motor system.	Monocular. Uses only one receptor.

Profile Design by
Wayne Knight, O.D.
Morgantown, W. Va.

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

DEVELOPMENTAL CARE AND GUIDANCE - V

August - 1959 Series 3 No. 11

The second half of the "Profile for Determining Visual Performance Levels" is presented this month. It is sincerely hoped that you have had occasion to lay several cases upon the portion of the profile you received last month. If you have done so, you will have found some of the uses which are being recommended by those men who are now using it.

Section II should be attached to Section I so you have a chart 8 1/2 inches wide by 20 inches long. This will allow you to lay the complete profile out on your desk for ready reference and a continuous horizontal plotting of each case. You will immediately recognize that Section II will be very significant in the analysis of every achievement problem where vision must carry the dominant performance load. Section II, which deals with the organismic freedom to abstract and synthesize, is closely related to the battery of tests which gives so much information about visual performance within academic demands.

A brief review of the diagnostic techniques which apply directly to this section is in order. Column F, which is titled "Visual Form," describes the observation which can be made at each level of performance on any type of form board. The set of three form boards, which were made available several years ago by Dr. J.Y. Phinney, of Mountain Home, Arkansas, and a similar set available from Childcare Company, Box 366, Loveland, Colorado, are most useful for determining a patient's level of performance in this area. The Circus Puzzles, the Key Form Board, and the Stoelting Boards all give valid information if an observer will pay attention to the patient's method of completion. Actually, this information can be gained if one makes careful observations on any type of jigsaw puzzle. The form boards, previously and thoroughly discussed in this series, are very carefully designed to elicit the patient's performance in such a manner that the processes by which he completes the form boards are most observable. These test materials will immediately demonstrate a process of trial and error placement of the forms.

If the individual makes random trial and error placements, or traces the shape of the form or the hole with finger tips, it is quite safe to assume he is using very little visual discrimination in completing the task. It is frequently interesting to watch such an individual because he operates as if he were refusing to look at the board, and in many cases the retarded child can do better on these boards if he closes his eyes or actually looks elsewhere. It almost seems as if the visual information interferes with his hand activity. This would be considered the very lowest level of visual form development.

The magnitude of visual participation in performance on the form boards indicates the level of achievement possible for each patient. The top level performance would be observed in the patient who uses vision in advance of all hand activity. For example, the patient looks at the form board, immediately locates a form to fill a hole, and while hands are placing the form, he will be using his eyes to find the next piece. Levels 3 and 4 are more critically elicited on split forms. Frequently an individual can place a half of the form into its proper hole but then must search for the other half to complete the form. This individual operates as if he could see the relationship of the piece to the hole but does not perceive the relationship of the halves to each other. This, of course, is the most common performance,

and it is most thrilling to see a youngster achieve the fourth level, where each hand picks up a half of the form, combines them and places them simultaneously to fill the position on the board.

Parenthetically, it has been interesting to note a high correlation between top level achievement in visual form and spelling ability in the classroom. We have frequently commented that spelling skill is closely related to the ability to visualize. It certainly seems that our clinical experience with the form boards justifies this comparison. It seems very reasonable to us that the youngster who immediately sees the relationships of the halves of the split forms to each other is more likely to see the relationships of letter combinations which make up the words in his spelling lessons.

Since we are philosophizing just a bit from clinical experience and not from a rigid statistical analysis, we take the liberty of making another supposition. It is our present opinion that the youngster who is excellent in spelling but fails to perform above Level 3 in visual form, has probably learned to spell on the basis of rote memory. Perhaps this youngster reproduces the requested word by directly matching the request with a memorized pattern of letter sequence. He probably does not actually visualize the size, shape, and letter structure of the word requested but is spelling what he memorized. Thus, we could have good spellers who cannot achieve the #4 Level. We can still say, however, that the youngster who does achieve the #4 Level is more skillful and fluent in spelling the words of his language.

Column G is titled "Visual Size." Performance in this area is most easily observed on the Sized Blocks, which have also been discussed in previous papers. The alert observer will see many other performances which indicate a patient's ability in making visual size discriminations. The Circus Puzzle will immediately uncover an inability in size judgment. On one end of the performance scale the retarded child may try to place the elephant into the rope climber position because of the similarity in shape of the elephant's trunk and the rope climber's feet. (The two pieces being discussed here are found on the Circus Puzzle designed and produced by Childcare Company. Similar examples can be found on the original Circus Puzzle, which was imported from England.) On the other end of the scale the superior individual, who makes immediate visual judgments of size, will not confuse large and small pieces, even though he may confuse intricately similar forms.

The most information, of course, is obtained from the Sized Blocks. Completely inadequate performance in this area would be demonstrated by the individual who could only match sizes of the blocks by placing them beside each other and then feeling the top surface to determine whether or not they were of equal height. Sub-adequate performance would be demonstrated by the patient who could differentiate large and small blocks but could not make the judgments of one unit difference except by tactual exploration. Number 3 Level performance would be demonstrated when the patient could make immediate visual discriminations of blocks of equal sizes. This individual could upon instruction pick out all the blocks of a size by making a visual inspection first, and the hand action would then follow through. Number 4 Level performance will be observed when a patient can visually determine the sequence of sizes necessary to make a stairway out of the blocks. When the patient can achieve such a result, it is quite safe to assume that he can make immediate visual judgments of the particular size of blocks he needs in his stairway, and he probably possesses a size constancy perception which allows him to judge that the next block must be larger than the one he has just chosen.

Here again, clinical experience leads us to some interesting conclusions. We feel there is a very definite correlation between the #4 Level of performance of visual size discriminations and basic number skills. The youngster who shows that he can manipulate Sized Blocks immediately and fluently has usually shown that he can manipulate numbers with meaningfulness. We have frequently philosophized that number facility and size constancy are close-

ly related skills. Our observations of performance on the Sized Blocks and the performance in schoolroom basic arithmetic show a high relationship.

A child can be good at arithmetic and still not achieve #4 Level in visual size discrimination. The more we analyze the processes by which children do arithmetic, the more we recognize that children can memorize their "times tables" well enough to get high grades and still have no visual processes or recognition of the size factors inherent in numbers. Many children demonstrate the ability to rattle off their multiplication tables who cannot demonstrate that the product is bigger and would occupy more visual space than either the multiplicand, or multiplier.

Column H is titled "Visual Space" and is one of the most difficult processes to observe. We see evidence of this process in every test we make, but it can only be identified by deductive reasoning. We feel strongly that an individual's awareness of visual space is based upon his knowledge of what position in space he himself occupies, and that we must analyze his visual space by the manner in which he orients himself. Many of our judgments of the solidity of an individual's space world can be obtained as we observe him move about. The retarded child who bumps into every object in his surroundings, or the high progressive myope who has given up much of his peripheral visual space, will show sub-adequate performance. These individuals seem to know only where "here" is. They frequently have very little of the "here-there" awarenesses that are so essential to organization within a visual space world. On the other hand, an individual who operates on the #4 Level "flies" himself, his car, or his airplane with a complete solid awareness of the space around him and his "seat" position within it.

Much information regarding an individual's visual space awareness can be obtained from the Visual Forms Test. Perhaps many of the implications of this test have been overlooked in attempts to make simple correlations between the forms drawn on paper and scholastic achievement. This does not mean that there is no correlation, but we do feel it is important that some of these implications be recognized.

The manner in which a youngster places his forms on the blank sheet of paper provides some important clues. We have stated that if he placed these forms across the top of the page in a left to right sequence, he had acquired a degree of acculturation. We have had to decide when the forms were thus placed whether the youngster was squeezing them into the space allowed by the sheet of paper or whether there was merely an attempt to copy the shapes (a duplication of visual form and a violation of visual size) with no awareness of localization, direction, or spatial position in relation to the sheet of paper. In some cases a youngster was even penalized for shortening the base of the square to avoid overlapping a previously drawn form. It is very possible that this is the better performance, that the youngster realized that the second form could not violate the first form, and so warped it to fit the space that his visual discriminations told him was available.

The retarded child at the lowest level of performance might reproduce an erratic circle, a tilted plus sign, and possibly a round cornered square. If this is all he is capable of, he is at least able to change the direction of his pencil movements. A concept of direction indicates that he knows he must go somewhere from "here," and this is the beginning of the "here-there" sequence. A youngster who has achieved the #4 Level will draw his geometric forms with dexterity, and the resulting drawing will very closely match the test patterns. This youngster will ask for another sheet of paper because he will immediately perceive that he does not have room on the page for another form unless there is enough space for it. Here we have the individual who reproduces what he sees because he can combine visual form with visual size to get an accurate representation of the visual space indicated by the geometric form.

The "here-there" relationship is a very important one, and we feel that it has some correlation with classroom achievement. More and more we are aware of the fact that the youngster who transposes p and b, b and d, p and q, on and no, was and saw, etc., is having difficulty in a

basic directionality of visual space. Such a child can identify his own right hand or his own left hand but will immediately confuse the hands of a person facing him. This would indicate that this child has probably not progressed beyond Level #2. The child who spontaneously offers the information that the word, p-e-p, says the same thing frontwards or backwards is already aware of his ability to transpose for a purpose. This youngster can visualize the word as if he were viewing it from another spatial position.

Column I is titled "Concept Visualization." This title is used for a specific purpose because we feel it is synonymous with "Spontaneous Drawing." If an individual has gained a complete concept of an object, he will be able to visualize it well enough to make a very adequate representation of it on paper. One whole paper could be used to further discuss the four performance levels in this column of the profile, but it is felt that previous papers have discussed it very well, and there will be further discussions in papers to come. Neither will space be used at this time for further discussion of Column J, which is titled "Book Retinoscope." This also has had much previous discussion and will be further elaborated in later papers.

For many years now Dr. A. M. Skeffington has been defining vision as "the process of synthesizing and abstracting the experiences of the organism and mobilizing them upon the instigating trigger of a visual datum." We definitely feel that this profile adds breadth and depth to this definition. Section I of the profil outlines the processes by which the organism gains experience and how this experience is related to the visual mechanism. Section II of this profile illustrates th processes by which these basic experience can be abstracted and synthesized in visual performance. The profile as a whole, when Sections I and II are combined, outlines many of the processes that are instigated by any visual input. The level of performance achieved by an individual as a result of a visual input will be determined by his adequacy in each of the processes described. We are confident that this profile can be used in many ways, but its greatest value will come as a method of charting each individual case for the determination of developmental progress at the moment of examination and the determination of training and guidanc for the further enhancement of visual ability.

Next month's paper will discuss this profile as it especially applies to training. In the meantime, it is again recommended that you consider each case in your offic as it relates to this profile. The final paper in this series can be of greater help to you if you will use this profile as suggested.

SECTION - II

DEVELOPMENTAL PROFILE FOR DETERMINING VISUAL PERFORMANCE LEVELS

FREEDOM TO ABSTRACT AND SYNTHESIZE

(F) Visual Form	(G) Visual Size	(H) Visual Space	(I) Concept Visualization	(J) Book Retinoscope
Total form abstracts or synthesizes into wholes.	Sequence and combination. Can utilize size in orderly sequence in combination to produce a size-constancy result.	Complete space matrix. Identifies all directional axes by name. Knows own spatial positions and can transpose.	Draws voluntarily. Can bidimensionally represent tridimensional experiences. Figure-ground time concept (past-present-future).	Free reading level abstracts and synthesizes for full comprehension.
Direct form. Matches form to form but can't abstract silhouettes.	Combinations only. Visual relationships and matchings. (dimensions)	Partial space. (form-location) Can identify own spatial position but cannot transpose without processing or itemizing.	Draws reluctantly or can only copy or draw upon suggestion. Omits depth and/or size. Time concept is now only. Figure only.	Instructional level. Must evaluate, process and itemize.
Partial form. Matches by segmenting, details without relationship to shape.	Visual size. Likes and differences. (distance)	Self direction (here-there). Can only partially identify own spatial position. Can not transpose.	Imitates only. Form, size, depth and direction of movement all inadequate. No time concept.	Lack symbol skill. Must revert to hand reinforcement or verification.
Tactual or random. Matches by feel or by trial and error.	Tactual size. Must verify all sizes by contact matchings.	Non-directional (here only). May even have difficulty identifying location or direction.	Cannot represent. Will not draw.	Non-reader. No symbolism.

ATTACH SECTION I HERE

VOLUME 31 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

DEVELOPMENTAL VISION

A new series by G. N. Getman, O.D. and N. C. Kephart, Ph.D in which the significance of DEVELOPMENTAL VISION in modern, preventive optometry is set forth. It presents the functional optometric approach to the visual problems of child and adult in meeting the demands of the culture.

DEVELOPMENTAL CARE AND GUIDANCE - VI

September - 1959 Series 3 No. 12

This paper will complete Series 3, and it seems appropriate to close the "academic year" with a discussion of training procedures. It is very interesting to look back over the papers in these two series and read the frequent references which have been made to the total motor system. More time has been spent considering the foundations for visual performance than thinking about the actual ocular machinery. This is the result of the realization that vision is a total process of the total organism. There is a danger in this thinking unless it is also realized that vision is primarily dependent upon the eye as a receptor of light. No matter how extensively humans learn to substitute and transpose other receptor mechanisms to gain visual information, the eyes are still the most important receptors for building a complete and usable space world. There is a paradox here which must be recognized. A complete and ultimate space world cannot be built by an individual without eyes, but neither can it be accomplished with eyes alone. Since this paradox exists, those who believe that vision is the dominant factor in all behavior must constantly strive for a balance in their thinking. If this balance in thinking is maintained, the paradox becomes a springboard instead of a stumbling block.

It would be very simple to present several cases as examples of how the profile could be used to determine training procedures. An imaginary case, however will be more appropriate to the youngsters that are seen in every optometric office. The patient is a boy, age ten, failing in third grade for the second year. His parents are convinced he has not had good teachers for any of his school years and insist that he would be able to learn if he were given some help. His father states that he knows the boy is not dumb because he is so smart about everything else around the home and has learned how to do chores very dependably. His mother comments that he enjoys television and has learned much from watching it. He carries on intelligent conversations with other members of the family, but he cannot read, his spelling is very poor, and his arithmetic is fair if he does not have problems where reading is necessary. The youngster has had the usual eye tests, and his parents have been told he has perfect eyes because he has 20/20.

The results of the visual examination are very typical. He has 20/20, both far and near, but confuses similar letters. His analytical shows a .50 D. hyperopia with expected exo.'s, and all duction findings are low but adequate. Numerically, the boy is a B_1 case, and a +.50 or +.75 is acceptable within the case analysis. All visual abilities tests show acceptable performance with no extreme deviation except on pointers.

An attempt is made to elicit more basic visual performance. With dangled bell, fixation is extremely difficult, and pursuits are very poor. His eye movements are extremely jerky, and pursuit fixation is only maintained with head movement. Pursuits improve slightly when he points at the bell, and both fixation and release improve with hand contact.

A review of the analytical findings at this point shows that the added notations regarding his performance in each test situation are significant. The retinoscopic reflex is variable on #4. On #5 there is a suggestion of minus cylinder, axis 90, with an occasional dulling of the reflex in the left eye. All phorias are noted as variable. There is no awareness of SILO responses. Number 14A "walks up in plus." Number 19 has a question mark on it.

Since this is primarily a visual achievement problem rather than a visual acuity problem, further tests are administered. Visual form and visual size judgments prove to be sub-adequate. His form boards show confusion, and his sized blocks illustrate his difficulty in choosing anything except by obvious differences. He has difficulty identifying right or left hand and is completely confused when asked which is the examiner's right hand. His spontaneous drawing is a very poor representation of a house with no consistency in size or placement of windows. His book retinoscope shows "against" on some details of the picture in THE MAKE-BELIEVE PARADE. He is asked to assemble a truck with Blockraft blocks, and while doing this the retinoscopic reflex shows a more consistent "against" motion. As this boy walks around the office, general observations are made of his clumsiness and especially his heavy-footed walking pattern. He can only hop a couple of times on one foot before losing his balance, and he uses hands to support himself and orient himself as he walks through doors and hallways. Upon further questioning his parents report that he wants to play ball with the other boys but is never chosen on one of the teams and spends most of his time watching the others or riding his bicycle at random.

Laid upon the profile this case is found to vary between Levels 2 and 3 in Columns A,B and C. The patient probably is in Level 2 in both Columns D and E. His case falls in Level 2 in Columns F,G,H,I, and J. A more critical view both in examination and analysis might cause his performance in Level 2 in Column J to be questioned. He may be given the benefit of the doubt, however, because of his parents' report that he has profited from watching television and has attained some degree of symbolic skill as a result of it.

Although this imagniary case can be profiled in the adequate levels in the first three left-hand columns, training must be instituted that will assure more organization within these basic processes. Here is the individual whose space world has not been accomplished with "normal eyes." Therefore, the outline of training procedures would start with the motor activities that will assure kinesthetic and proprioceptive development.

A. Organismic Gross Motor Development

1. Krauss-Weber Series
2. Angels in the snow
3. Obstacle course

(Each of these routines would be used to develop cephalocaudal motor patterns. Although these routines are listed above in a particular order, they can be interchanged as long as the patient is constantly aware of the part of his body being used. A youngster such as described here, would not be instructed "Move your right arm," because he is not sure of his right arm. An arm or a leg would be touched and the child told to "Move this." To increase the youngster's familiarity with his extremities, verbal reinforcements are used by asking him to name the body part which he is moving. It is especially important to realize that these gross motor activities are being used to develop awareness and freedom of movement and not to build muscle cross section. Again, this is in accord with the view, "Thoughts that never get into the muscles never fully possess the mind." Thus, exercises such as the above are utilized in visual training to provide awareness and organization of movement patterns.)

B. Reciprocity of Organismic Halves

1. Jump Board
2. Walking Boards
3. Trampoline
4. Catching a balloon or beach ball

(These routines all demand a balance and counterbalance of the two architectural halves of the body and its components. Although these routines are still basically in the gross motor area, a start is made on introducing the visual component with the expected performances. Activities on the balance board and the trampoline are probably loaded with peripheral visual components, but walking boards and the beach ball activities bring in a strong centering factor.)

C. Eye-Hand Relationships

1. Chalkboard Routines
2. Pointers
3. All commonly used eye-hand procedures outside of stereoscopes

(There is no need to elaborate on these routines, but it is important to note that the chalkboard activities demand an organization and integration of all the skills developed in previous training procedures. It is important also to emphasize the significance of the visual aspects inherent in these routines. Bimanual circles emphasize hand movements but also provide peripheral visual experience. Follow the dot routines on the chalkboard bring the youngster to a level of visual steering, which places emphasis on both the centering and the identification processes.)

D. Ocular Dynamics

1. Swinging Ball
2. Near to far fixation
3. Rotational devices
4. All standard routines for saccadic training inside and outside of stereoscopes or other instruments

(The patient is now ready to participate in routines which used to be considered basic. The developmental concepts and the awareness of total organismic organization lead to an understanding of why some "basic visual training" is really advanced visual training.)

E. Visual Consistency

1. Accommodative Rock
2. Updegrave
3. Stereoscope Routines
4. Polaroid Rings

(Here again there is no need to go into detail. All of these routines are familiar, and the only wish here is to emphasize the importance of utilizing these routines late in the training program. Especially when dealing with a youngster such as the imaginary case here, these routines just named would defeat the purpose entirely without a development of skills which precede the ability to perceptually cope with these routines.)

A design for a complete visual training program is not easy to accomplish. A formula or a recipe cannot be written for it, but an attempt can be made to convey a total concept, which will allow appropriate and valid designs for each individual case. Perhaps the greatest difficulty in accomplishing this concept is expressed by the right-hand half of the profile. Note that the #1 Levels in Columns F and G emphasize the reliance on hand contact. It is only in these areas of behavior that every human being can move from actual motor activities into abstraction and synthesis on a visual level. A paper published in the AMERICAN JOURNAL OF OCCUPATIONAL THERAPY,* written by Miss A. Jean Ayres, O.T.R., has recently come to our attention. The concept discussed here is so well expressed by Miss Ayres that the liberty is being taken of quoting exactly as she has written it:

"'Organization of Proprioceptive and Tactual Stimuli.' While the contribution of visual impulses to visual motor performance is great, these are certainly not the only sensory stimuli which are organized into perceptions as bases for skilled upper extremity motor performances. The importance of manual manipulation in developing perception of form and space has been observed by Gesell and his associates, and Strauss and Kephart. As the hand feels the surface of a block, the feeling of space is conveyed through proprioceptive and cutaneous impulses resulting from position, movement and contact. The reaching involved in manual play lays the foundation for depth perception. Visual impressions reinforce and become associated with the manual impressions so that later visual cues can recall the cutaneous and proprioceptive, and the latter can recall the visual. It seems quite probably that the early development of the visual perception of

*Volume XII, No. 3. May-June, 1958.

space is largely dependent upon the proprioceptive perception of space.** Head movement also contributes impulses which are integrated into the perception of form and space.

"Bender believes that the perception of form in children is the outgrowth of motion.** Often motion (such as scribbling with a pencil) appears first and the perception of the result of the motion follows. Gesell has observed that the child's ocular-prehensory powers must be learned, and that the eyes are intimately connected with all of the neuromotor system. Much of the purposeful movement of the hands becomes so because the eyes have observed and directed it as such. If a block is thrown to a certain corner of the room, vision verifies that a certain proprioceptive and tactual pattern, when activated, will bring about a specific spatial relationship. A similar process takes place for all activity, thus establishing meaningful associations between the visual and motor aspects of performance. The eye-hand combination has been so influential in ontogenetic development that Gesell has referred to the eye as functioning as a prehensory and manipulatory organ. He refers to the combination as 'oculomanual prehensory apparatus.'

"In the early stages of development sensations arising from motor activity play an even greater learning role than later on in childhood when the visual accompaniments of the stimuli are largely sufficient for learning of either visual or motor tasks."

The task then in visual training is to provide routines that will allow the patient to extend his ability to abstract and synthesize from visual cues. The #4 Levels on the right-hand section of the profile are only achieved by those individuals who get the most information from the least visual cue. The following outline suggests some of the routines and training procedures which will assist the imaginary boy to rise above the levels he now occupies.

F. Visual Form

1. Simple Jigsaw puzzles
2. Tactual identification of shapes which he cannot see
3. Visual comparisons of similar objects
4. Templets
5. Parquetry Blocks

(These are just a few of the routines that can be used for illustration. Each of these activities provides an opportunity for very basic hand-eye and eye-hand experiences with visual form. Variations within each of these routines are numerous and can be suited to the individual case. Each of these follows the concept discussed by Ayres in the above quotation, and presented in Series II and III of these papers. One should not be fooled by the apparent simplicity of these routines. Jigsaw puzzles, Templets, and block play are not too simple for a ten year old just because of his age. The imaginary boy would have considerable difficulty with some of these routines. The routines must be so presented that there would be both a challenge and a success that would allow more complex activities later.)

G. Visual Size

1. Object comparison and sorting according to size
2. Nested cubes or objects
3. Chalkboard activities which allow the child to duplicate form and size
4. Advanced jigsaw puzzles

(Here again only a few of the possibilities have been suggested. Every training patient should be placed in training situations which demand that he make visual size judgments. Those and the skills in visual form are the judgments that contribute to his advanced abilities so necessary to achievement in the tasks of the classroom.)

H. Visual Space

**Underlined by these authors, not by Miss Ayres.

1. How far is it?
2. Can I touch it from where I am standing?
3. How many steps must I take to get there?
4. Which direction is it?
5. What would it look like if I were on the other side of it?
6. What direction is it going?
7. What direction would it be going if I were in another position?
8. The materials of Lyons and Lyons.

   (All of the above questions express routines that can be used to develop concepts of visual space. There is no way to convey specific activities because this visual skill can be practiced in every waking moment. Convey to the patient that this practice is important and he will find himself "doing his training" within all of his daily activities. This is the ultimate in training because he has now carried his routines out of the training room into his everyday life.)

I. Concept Visualization

1. Chalkboard
2. Making scrapbooks
3. Finger paints
4. Templets
5. Serial reproduction
6. Form emergence
7. Many other tachistoscopic routines and especially, the Lyons and Lyons Series.

   (It is not the intent to teach art or to make artists out of training patients. On the other hand, it is the intent that training patients be able to put on paper a representation of what they have seen. The routines suggested above should incorporate all the abilities that have come out of training in visual form, visual size, and visual space.)

No particular routines are being listed for use in the training room to develop reading skill as such. If a proper job of directing the training has been done in all of the preceding processes, patients will learn to read, both inside and outside of the classroom. It is our opinion that reading training should be left to the educational profession and is not a part of optometry. If we fulfill our obligation to our patients, develop the visual abilities and the visual processes which are described in our profile, then we have made a significant contribution and have laid the foundations upon which teachers can build academic skills.

Perhaps in closing this paper a few of the values of this profile can be summarized. Most of these have been suggested by the men who are now using this profile, and the following have come from Dr. W.R. Henry of Warrensburg, Missouri:

1. It gives a sequential organization of the total philosophy of developmental vision.

2. It permits charting an individual's case and laying out a program of guidance.

3. It allows the recharting of a case after training to determine its progress.

4. It can provide a common ground for discussion with other professions, who have a sincere interest in children, their development, and their performance

You are sincerely urged to make extensive use of this profile. We feel certain that many further developments will ensue as a result of the excellent work done by Dr. Knight in designing this profile. You will be kept informed of these developments and we should appreciate having word from you concerning the uses you have made of it.

VOLUME 32 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

ARRANGING THE APPOINTMENT

October - 1959 Series 4 No. 1

(A Series Based on the Optometric Procedures of G.N. Getman, O.D.)

You will note this series of papers now has a new title. This title was chosen because it more nearly expresses the concepts now held relating to visual performance. The word, operational, is a functional word. Webster's definitions of the word, operation, show how appropriate this term is. Operation is (a) "The action or quality of producing a desired effect or result," (b) "The carrying out of preconcerted plans by regular movements," (c) "A process or method of working." The dictionary states, "Preconcerted plans are those established by previous agreement." All of these could be rephrased for optometric purposes, and operational vision could then be defined as "the action or quality of producing the desired effect or result in the interpretation of things seen, by the process of carrying out of preconcerted plans by regular movements of the ocular machinery, and finally determined or settled by previous agreement and matching with experience."

The optometric methods for obtaining the most information on any patient must also be operational. This series of papers will describe the procedures which have proven valuable in actual practice. This material will not deal with specific cases but will present much general information from the moment the request is made for an appointment until the final conference and disposition of a case. Many papers have been spent on examination techniques, but not enough consideration has been given to the preparation of the patient or the patient's parents before the actual examination is done. Neither has there been enough discussion of the conference following an examination when communication between optometrist and patient spells success or failure on the case. Many excellent techniques win the battle and lose the war because a concise understandable package of visual care is not presented to the patient. Professor Renshaw has frequently stated that "prodromal set" determines the final result of every action.

The optometric care and guidance, available now from literally thousands of well-trained men can only be provided when desired by the patient. It is important to achieve a "set" of prodromal desire before the patient arrives in the office. Adults can sometimes be "snowed" into buying care for themselves because of the fancy words they hear. Parents will provide the ultimate in care for their children only if it is understandably reasonable, and when they can be certain that it is the right thing for their child. They will gamble with themselves but not with their children. The following suggestions come from the experiences of many optometrists who are now providing visual care for children of all ages.

Most offices probably receive requests for appointments by telephone. During this conversation the child's age and grade in school should be obtained and placed on the appointment sheet. The receptionist should take this opportunity to tell the parent that these items are important because the optometric examination is always planned according to the child's age and schoolroom demands. If the child is of preschool age, comments should be made about optometry's interest in visual readiness for the school load the child will be facing soon. This first conversation with parents is also an ideal moment to emphasize preventive care. The receptionist should comment about how wise the parents are to have a very complete visual examination. A remark about the

visual problems that can be prevented through complete early guidance is most appropriate and will start the parents to thinking about something more than just an "eye test."

Before this conversation is completed, the parents should be told that they will receive a preliminary history form by mail to be filled out as completely as possible by them. They should also be instructed to return the form as soon as possible. There are several of these forms available, and they are extremely useful in obtaining the developmental history.* Many parents have commented that they knew the examination would be complete because of the questions asked on these forms. This, of course, is one of the major purposes of the parent interview blanks, but the actual information which can be obtained from these is very significant and will determine your course of attack upon the problem. Furthermore, a splendid indication of parent attitudes toward their child is indicated by the manner in which the form is completed. If the form comes in early with every blank filled, it usually indicates that these parents will be cooperative and are eager to have full information concerning their child's vision. If, on the other hand, they bring the form with them incompletely filled--and sometimes in the unopened envelope--it is wise to take the time to fill the form before the examination is started. This gives further opportunity for conversation about the importance of vision and its relationship to school achievement.

A few moments should be allowed in the examining room to go over the interview form with the parents, and this will be discussed in a later paper.

If the appointment is made by one of the parents in person, the above procedures still apply. You will find that this takes very little time, and a few well-chosen sentences about the child's welfare and his school achievement will set off a line of thought which will open several avenues of discussion when the appointment is kept. Between the time the parents receive the interview form and the appointment time, they usually think about the child's schoolwork and will frequently ask very intelligent questions. It is quite common to have the parents remark that they had not given much thought to the load placed upon a child's eyes until they had to fill out the interview forms. They sometimes remark that the questions which pertain to school made them wish they had made the appointment a year or two earlier. All of these questions in the interview form seem to influence them toward an analysis of their child's classroom problems, and they usually conclude that their child does have a visual problem rather than an intellectual problem.

The full value of the interview form will only be realized after it has been used for a period of time. These forms are now being used extensively, and most of the optometrists report that they feel they know the patient before he walks into the office. In many offices other children are brought along at the time of the appointment, and one of the most important contributions of the form is the immediate identification of the child to be examined. The child and the parents appreciate this immediate friendly approach, and this also will be discussed in a later paper.

Each section of the form will give pertinent clinical information. Section A (Present Situation) will indicate to you whether the appointment was made because of discomfort or because of inadequate school achievement. You will immediately be able to program your office time accordingly and can decide whether or not you wish to plan for an analytical (refractive) examination, a developmental examination, a visual-perceptual examination, or a combination of all three. If the preliminary information indicates a refractive problem, you can organize your thinking in advance so you will know what problems you wish to demonstrate or discuss with the parents. If the form indicates that it is a school achievement problem, you will be able to organize your thinking in advance so you may dis-

*The long form for preschoolers is available from Childcare Company, Box 366, Loveland, Colorado. The short form for grade school children is available from Dr. John Streff, Pipestone, Minnesota.

cuss vision and school achievement with the parents. By planning for the appointment you can organize pertinent literature and reference books, which will probably apply to each particular case.

Section B (General Health) will give you some information concerning the present health of the child and will indicate the background events which might have contributed to the present visual difficulties.

Section C (Developmental History) will provide an opportunity to explain that vision is learned, and that total organization of motor patterns is essential to good visual performance. Section B might indicate that because of severe illnesses with high fevers you can expect an accommodative problem. Here in Section C the lack of early motor patterns, which should result from crawling, walking, and early speech organization, might indicate a convergence or ocular bilaterality problem.

Section D (General Behavior) will provide almost unlimited information. Most parents fill out this section very carefully, but this is also the section where visual performance and general behavior can be quite closely related. General behavior is always a reflection of a child's classroom performance, and his pastime activities. Extreme fatigue, pastime preferences, and eye-hand performances will provide significant clues for the direction of the actual examination.

Section E (School) can be matched with Section D, and many clues to developmental problems can be obtained.

Section F (Visual History) provides the usual history information, and it needs no particular discussion. Parents are often impressed by the fact that these were the only questions asked on previous examinations and expressed their surprise over all of the other questions that precede the actual visual history.

There are probably many advantages to this interview form beyond those mentioned here. Every optometrist making use of the form expresses his personal reasons for liking it and continuing to use it. It is very important that everyone who uses it guards against pre-analysis of a case from the information gained before seeing the child. One must always realize that there is a danger in "reading tea leaves" <u>before</u> the actual examination. It is never safe to assume that severe illness and a high fever will create an accommodative problem. Neither is it safe to assume that the child who by-passed creeping, or substituted bottom bumping or seat sliding for creeping, will be cross-eyed. Although there has been much emphasis placed upon the development of eye-hand coordination, the child who is not good with his hands is not necessarily poor in workbooks.

The child who prefers television or phonograph to reading is not necessarily an audile child. Therefore, it is never safe to prediagnose from these sections of the interview form and to assume that the child is a failure in school because of the holes in preschool development. All of this information is significant, and each clue must be added to the total syndrome before any statements are made to the parents regarding the cause of the child's difficulty. The more information you can receive in advance, the more meaningful will be the performance you see during the examination.

There are a number of methods of notifying patients of their appointment. This office has never found any better methods than those recommended by Dr. Ralph Barstow. Up to this time the postal card notice had always been used very successfully. There are now many enclosures concerning children's visual care that will contribute to this prodromal set. Now that there is only one cent difference between postal card and first-class postage, an enclosed card similar to the Barstow appointment card is being considered for children's appointments. A local dentist uses an enclosed card and reports nearly 100 per cent compliance. This method will allow the use of folders such as the new one available from Dr. Hugh V. Brown of Berkeley, California. This pamphlet was mentioned by Dr. Barstow in his June 1, 1959, Bulletin, paragraph 696.

In summary, optometric visual care for

patients of all ages will be successful in direct ratio to the attitude the patient brings into the office on his first visit. There are many actions that can be taken by the receptionist and the optometrist to establish the all-important prodromal set. If patients know before they walk in that visual care is more than acuity on a chart, they will be more cooperative during the examination and more communicative during the post-examination conference. If an optometrist waits until the examination is completed before establishing communication, the conference will take longer, and the final results will probably not be as productive of the results desired. The attitudes of all patients are fairly well established by the time they make the appointment. The information they receive from the time the appointment is made until they walk into the door convinces them that they were correct in making the appointment or makes them wonder whether or not they should have bothered with it. If this patient comments about his appointment with you to someone who is not acquainted with your work, this third party might well convince this new patient that he should go elsewhere.

You should see to it that all patients have the proper answers before the examination as well as after the examination. The confusion that exists in the minds of the public and being extended by non-optometric sources, needs positive dynamic action. The parents who are considering an optometric appointment for their child should know in advance why they made a good choice because the patient is still not yours until he walks into the reception room.

Next month this series will discuss the real reasons for a children's corner in the reception room.

VOLUME 32 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

"THE RECEPTION ROOM AS AN OBSERVATION AREA"

November - 1959 Series 4 No. 2

Last month's paper closed with mention of the real reason for a children's corner in optometric reception rooms. For a number of years Dr. Ralph Barstow has recommended a children's corner and has strongly emphasized its value. He has frequently discussed the opportunities this corner gives an optometrist to comment about his interest in children. As is so frequently the case, other professions have followed the pattern set by optometry, and nearly every dental office has a small table and chairs or a special rack for children's literature. Dentistry, of course, realized the public relations value of children's furniture and has used it extensively.

Now that optometry is in a position to serve children, the play corner becomes more important to every office. It is a well-known fact that all children are more comfortable when they have their own toy areas and clothes chests. By the time a child is four years of age, he utilizes these areas in his own home as orientation points. This gives him a sense of security and comfort which makes the adult world, in which he so frequently must live, less overwhelming. When the young child leaves home for the first time to attend school, he does much better if he can take some of "home" with him. The majority of understanding kindergarten and first-grade teachers urge their children to bring a toy or some favorite item to school. This is the bridge that children need when they take their first big step out into the world.

It is not easy for a child to bring toys to a professional office, but it is easy to provide the materials which a child will immediately find and enjoy as soon as he walks in. A properly arranged children's corner can do much to let the child get comfortable. The majority of children approach the optometric office with memories of previous visits to offices where there were moments of extreme discomfort. These memories can be quickly superimposed with pleasure if the children's corner is properly arranged. This will assure an environment of comfort and fun, which creates a prodromal set that is just as important with children as it is with adults. The level of communication established between optometrist and child is determined by these first few moments in the play corner.

The children's corner can easily be overdone and overdecorated to the point that it impresses adults but does not appeal to children. A corner that is too elaborately decorated can take on the aura of a display like those children frequently see in department stores. This display will almost speak to the child, and he shies away from it as if it were saying, "Do not touch." A corner can contain too many items. If there are a number of toys and a number of children's books in the corner, the child will want to explore each one of them, and the entire appointment time may pass before he has fully investigated each toy.

The most important items are a small table and matching chairs. Children like to be seated in furniture built for them. If there is not space in the reception room for the table, there should at least be room for the small chairs. All small children are much less restless in furniture that fits them.

If a wall decoration is desired, there is a brightly colored picture now available which depicts many of the familiar fairy tales. This picture is 38 inches long and 28 inches high and is entitled "The Land of Make-Believe." It is available from The Child's Wonderland Company,

Grand Rapids, Michigan, and costs approximately $3.00. It may be ordered folded or rolled and is being used by a number of optometrists. It can be fastened to the wall at the children's table height so it may be inspected by the child while he is seated at the table. This has proven to be a very fascinating picture to all but the very young child. Many adults will get down on their knees to inspect it. If it is covered with a sheet of plastic, children can trace their way through the fairy tales without leaving finger prints or candy smudges.

The most satisfactory item to place on the play table is a set of Blockraft. This set of wooden blocks of various sizes, with the pegs to fasten them together, has frequently been mentioned in lectures and in this series of papers. Children of all ages enjoy the blocks and will find many ways to use them. The very young child enjoys playing with and removing the pegs. Older children will make elaborate models of cars, trucks, airplanes, and space ships.

After a number of years of observing children playing with these blocks, the only criticism that can be made of them is the difficulty being encountered in obtaining the sets. Some optometrists have been successful in getting their local toy stores to stock the two sizes available. Many others have had so much difficulty in obtaining these sets that the Johnny-Linn Variety store in Luverne, Minnesota, has been stocking them especially for optometrists. The small set sells for $2.98, plus postage, and the large set for $4.98, plus postage. The larger set is definitely recommended for office use. These may be ordered from the above store either open account or C.O.D. and will be as important a piece of equipment as any test materials in the examining room.

Time should be arranged so each child has a few moments to spend at the play table. Most children go to the table immediately, but a few will need to be encouraged to make use of the Blockraft. They should be given enough time to explore the sizes and to make some simple model if they desire. It is best if the optometrist moves into the reception room but does not immediately approach the child. It is frequently best if you ignore the child for just a few moments.

The most important instruction that can be given to every optometrist is <u>Do Not Swarm Down</u> on the child the moment he enters the office. After the youngster has had a few moments at the play table, he should be greeted simply by name without baby talk or sweet talk. Commenting about the weather or remarking about what a big boy he is contributes nothing to the child's comfort. He feels he is being talked down to, or too much attention is being given him. Too much talk will be recognized by the child as a snow job. This was well expressed by Burton Hillis, The Man Next Door, in the August, 1959, BETTER HOMES AND GARDENS. "Know why it's so much harder to fool kids about how you feel about them than it is adults? Because they're not helping you do it. They haven't learned to fool themselves yet." After greeting the child the optometrist may walk to the play table and discuss what is being built. Characteristically, children respond more quickly to questions about what they're doing than they do to the more personal comments. If the child does not respond but does go on building with the blocks, the optometrist may gain the child's confidence by asking, "May I help you?"

These few moments can be important in setting a pattern for the parents during the examination to follow. This will give the optometrist the opportunity to indicate to the parents that the conversation is between the optometrist and the child. Frequently the parent will say, "Johnny, say hello to the doctor," or "Mary, here's that doctor you came to see." These can be moments of difficulty if the child has recently had an unpleasant experience with a doctor. This is the moment when the optometrist should turn to the parents and convey to them either by word or signal that their silence is preferred. If the child shudders at the term, doctor, you may wish to stoop closely to the child and whisper something like, "I know your name is Mary; my name is Dick." There are many times when it's wise to lose your doctor title until you have gained their confidence. It may be well to remember that patients of all ages are interested in what is done for them rather than the mere fact that a doctor did it. Respect comes out of comfort and confi-

dence--not a title. This is especially true of children. In some cases it is even wise to have the parents speak of you as mister rather than doctor in getting the child to come into the office willingly. Once the child finds out how much fun he is having, the title can be reinstated. All of the foregoing applies to the child who has a fear of the doctor's office, but some of the above definitely applies to the freedom of communication that must be established when dealing with children.

Parents frequently comment about how willing their child is to come into an office where the stage has been properly set. One doctor, whose name is Harry, was always spoken of as Doctor in Bobby's presence. The occasion arose and the child was told that the doctor was being called. Bobby commented, "Oh, you mean that Harry doctor." This professional man had gained the confidence of the child and has maintained his professional status on the basis of first name friendship. One can be quite sure that this child will always know that he has a friend in Dr. Harry.

The importance of the reception room for making observations of visual behavior cannot be overemphasized. If it is possible to watch the child enter the reception room without being obvious about it, much information on gross motor patterns can be obtained. The manner in which a child visually inspects the reception room will give you clues as to his awareness of his surroundings and the contents. This first observation will frequently determine the actual approach to the child. If he is extremely reluctant and cautious, he may need more time at the play table.

As soon as the child indicates by his behavior that he is comfortable and interested in the blocks, the optometrist should begin to make observations of eye-hand performance. The manner in which he handles the blocks and the pegs may well indicate the results you can expect on actual tests in the examining room. His choice of blocks in completing a simple car can indicate the degree of form perception the child has achieved. His combinations of sizes and the placements of small blocks on larger blocks will give you important information about the child's concepts of parts that make wholes.

The way he uses his hands can give definite clues to the absence or presence of hand dominance. It is important to note how well each hand can manipulate the pegs. If one hand consistently manipulates the blocks and pegs, and the other hand gives no support, or only occasional assistance, observations should be made of ocular control as demonstrated at the table. One eye may be as inactive as is the nonsupporting hand. It will be important to note whether or not eyes move freely as they search through the blocks for a particular size. If there is excessive head movement, special observation of ocular control will be necessary during the examination. When the child looks up from the blocks to the optometrist or shifts attention from the optometrist to the parents, important observations of ocular teaming can be made. Any tendency to squint, or an actual deviation of one eye, can be caught by the observant optometrist while the youngster sits at the table.

Several optometrists have commented that they had difficulty in getting a child to leave the play table for the actual examination. In most cases this difficulty arose because there were too many toys, but this type of perseverant behavior can give significant information. There is positive perseveration as well as negative perseveration. Some youngsters resist leaving the Blockraft because they wish to complete the activity. This can be very positive behavior. Some children resist leaving the play table because they cannot release a particular activity. This is negative behavior and should be so noted. It is very important that the difference between these two be recognized. Neither need be a problem, however, if the child is handled properly at the moment. Whenever possible the assistant should accompany the optometrist to the examining room with her notebook so observations can be immediately recorded. This is especially true when perseverative behavior is encountered, because this information can be very valuable when the case is reviewed on a progress report. One of the most significant gains a child can achieve is his ability to more effectively complete a visual task, and this is an item which should be called to the attention of the

parents when the child's progress is being discussed.

By now some readers will be asking why so much time is spent in the reception room. All of the above takes much more time to tell than it takes to do. Practice at making these observations and practice in meeting and communicating with a child are important, and there is not a lot of time consumed. On the other hand, a few extra moments spent in the reception room can make the actual examination much more successful.

Moving into the examining room can be very easy or can present a major crisis. If a child is asked whether he wishes to move into the examining room, a crisis will usually result. Another basic rule to follow is this--<u>Do Not Ask The Child A Question Which Can Be Answered Yes Or No</u>. This is always true if you wish the child to do something for you. When it is time to move from the play table, a direct statement, "Now let's go into the other room and find some more things to look at," is successful procedure 90 percent of the time. If you say, "Do you want to go into the other room now?" 90 percent of the time the child will say, "No." The word, no, takes fewer muscles than the word yes. It is not only easier to say, but it is learned earlier, and every opportunity a child is given where the word, no, applies, he will use it. Make positive leading statements instead of asking questions.

Another excellent technique for children, ages four to eight, is the choice method. If he is reluctant to leave the table and is given the choice of moving into the next room where Mommy and Daddy are going or staying at the table, he will usually move into the next room. This choice procedure will work in most instances, but the choices must always be reasonable and should always apply to the examination activities. It is very easy to make the error of a bribe. The choice of an ice-cream cone or a piece of candy if the child will enter the examining room sets a pattern which will be thrown back at the optometrist time and again. Once this pattern is set, a child expects some sort of reward for every visit. It is much more appropriate for children to be reminded that the fun they have during the test situation is a reward.

There are always a few children upon whom none of the techniques will work. These children usually refuse to enter the examining room even though parents have already left the reception room. Occasionally a child of this type will throw a tantrum and make enough fuss that the parents especially become upset. If such a situation seems to be brewing, the optometrist should excuse himself from the play table to obtain a formboard, the circus puzzle, or some other appropriate test material. This should be taken back to the child and presented in place of the Blockraft. As soon as the child becomes interested, he can be enticed into the examining room with the statement that there are many more things which he will find to be fun. There are even rare cases when this will not work. If such is the case, it will be far better to make another appointment instead of forcing the issue and destroying the confidence that has been established by the Blockraft.

A number of comments have been made by optometrists about "uncooperative children." Perhaps it was really an "uncooperative optometrist" who tried to force through on a situation before the child was ready to move or before the child understood what was expected of him. The cooperative attitude is a matter of preparing a child before a move is made. The most difficult children (of which, there are really very few) will move to the examining room if they have the chance to anticipate it. If they are told, "After you make one more model, we will move into the other room," they have a chance to anticipate and prepare for the move. The assistant can also make an issue of moving into the examination room to get things ready for the child. There might be some instances where she would comment in the presence of the optometrist and the child, "I am now going into the examining room to get the pictures turned on for Johnny." Actually, this sets out another bait for the child, and if he has average childhood curiosity, he will want to see what is being made ready for him.

It is very important that the examination room is ready for the child, and there are simple pieces of equipment which will make this room less foreboding. Next month's paper will discuss the observations and techniques which should start

the moment the child moves toward the examining room. The tests that will be used there are of importance, and the real course of the examination will be determined by the prodromal set established at the play table. Thus, the play table becomes a significantly important part of the examination, the optometrist's communication with the child, the attitude of the parents, and a vivid expression of optometry's concern with visual performance and achievement of every child.

Next month we shall move with the child into the examining room, and discuss methods of producing an environment <u>for</u> each child there.

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

MAKING THE CHILD COMFORTABLE IN THE EXAMINING ROOM

December - 1959 Series 4 No. 3

Moving the young patient into the examining room is not always an easy thing to accomplish. Dr. Ralph Barstow has frequently stated that every human being experiences a few moments of apprehension when he enters a doctor's office for any kind of examination. Dr. Barstow and Dr. Skeffington have urged optometrists to remember that whether he expresses it or not, every patient is concerned with what he might be told about his eyes. Although a child does not analyze or rationalize his apprehension, he is even more cautious than adults about what will happen to him during an examination. This series has already discussed the importance of setting the stage with proper toys in the children's corner and proper greetings to the child as he walks in the door. Everything can be splendidly done in making the child comfortable in the reception room, and all can be lost the moment he walks into the examining room.

Last month the importance of assisting the child to anticipate moving away from the play table was stressed. This anticipation must not be destroyed by what he sees as he first walks through the door of the refracting room. This does not mean that a specially equipped children's examining room is necessary, but there are certain pieces of equipment that can be very easily added to encourage every young child. Probably the most important of these is a chair designed for children. A large modern refracting unit can be quite overwhelming, and it is not hard to imagine that a child would be more startled than attracted to it. Children's spontaneous choice of the small chairs in the reception room should be a clue to get something more appropriate for them in the examining room.

Pictured above is a small chair which can be adapted to every examining unit.

This little chair is easily made out of any child's rocker or wooden chair from a table set. You will note that the legs have been removed, and a box has been added for stability. A strap and buckle arrangement is easily attached so that the small chair remains firmly in place in the unit. The strap that goes around the back of the refracting unit will prevent chair and child from tumbling forward and is of such a height that a child has a place to rest his feet.

There are several distinct advantages to this small chair. It gives a youngster his own armrests and because of its size, makes the child feel that it is especially

placed just for him. There are a number of disadvantages to the padded boards like those frequently used in barber shops for small children. Many children feel that they are up in the air without support and will grasp the edges of the board so firmly that hand participation in test sequences is difficult and sometimes impossible. Experience has shown that children will usually climb into this little chair more readily than they will the unit itself, and this is especially true if they are brought into the examining room so they can immediately see this chair.

In spite of the advantages of this small chair, a few children are still reluctant to sit in it on the first examination. This reluctance can be handled a number of ways. The child can be challenged to climb in all alone. Frequently the challenge of the situation and the child's desire to prove his climbing ability get him seated before he realizes that he has been talked into it. If he is still reluctant, he should be told that his mommy or daddy can stand beside him. There should be room at the side of the unit so the child knows the parent is not too far away. The timid child may be immediately more comfortable if a parent holds his hand or stands close enough to be touched if the child so desires.

Sometimes a small child can be made comfortable by holding his mother's purse or his mother's handkerchief while sitting in the examining chair. Many of these seemingly little things can be of major importance in eliciting the cooperation of the child. As a last resort the small chair can be removed, and the child seated on the mother's or father's lap. Any trick or device which will get the child into the examining position is important. Once the child finds himself comfortable, and the test can be started, his cooperation will usually be forthcoming.

In the November paper reference was made to the pictures that are used during the examination. The projector should be in position before the child enters the examining room so that it may be turned on immediately. This gives the child something in which he can be interested and does much to get him started in the test sequence. If the youngster shows considerable interest in the pictures, it is sometimes advisable to do retinoscopy at far before any other test. If the child starts to look around the room and shows interest in the room's contents, then it is usually wise to immediately start with the dangled bell. It is always possible to go back to the projected pictures with a comment, "Now let's look at some more pictures." This same comment is usually appropriate when introducing the target for near retinoscopy.

There are other pieces of equipment which are conducive to a child's comfort in the examining room. Probably the two most important items, other than the chair pictured on page #11, are a 10-20 Harmon school desk and a wall chalkboard. The desk is another item for conversation about the things that are in this room "just for children." It is not unusual for a small child to spontaneously move to the school desk and ask for pencil and paper. If this situation is properly handled, it can be most useful in getting the child into performance in the very visual activities you wish to observe. If a child does choose the school desk and asks for paper and pencil or crayons, he should be given them with some statement that as soon as he has finished his picture, he <u>can</u> move to the examining chair for some other "games." This is not wasted time because it serves several purposes. A spontaneous drawing of some sort is valuable in his records, and it is also a step between the children's corner and the actual test situation. This may well be the same in-between step taken by adults when they sit at your consultation desk for a few minutes of conversation before they move into the examining chair.

The chalkboard can present much the same opportunities for a child that the desk provides. Do not hesitate to prepare the chalkboard in advance with simple pictures or scribbles that another child might have put there. This encourages the youngster to feel that since other children have been here, "It might not be so bad for me either."

It is quite important that there be no toys visible to the child in the examining room. Some of the Blockraft pieces and

pegs may be of use during the examination, but these should not be visible to the child until they are to be used. If the child is very young, dolls or teddy bears or even rattles can be used as test targets, but these should be hidden until needed. The projected pictures, the dangled bell, the near-point pictures and even trial case lenses can be utilized as new and interesting things. This opportunity is missed whenever a child sees toys with which he is familiar because he will always prefer the familiar things to the strange things, if given an opportunity. Each item of test equipment should be made attractive to the child by conversational description of it. When the dangled bell is first shown to a young child, call it a bell and make it ring so the child knows immediately what it is. Let him touch it if he desires before any actual test sequence is started. Knowing what the bell is and what it feels like, the child does not fear it as it suddenly approaches him in a test of near-point fixation. Having touched it once, the child will be more willing to touch it again upon request.

Many children show immediate alarm when the retinoscope is picked up. No child is impressed by a fancy name; the retinoscope should be called just what it really is--"a fancy kind of a flashlight." A child who has had an otoscope inserted in his ears and an illuminated tongue depressor placed in his mouth will usually be reassured by your statement that the object in your hand is just a sort of flashlight. If his attention is called to the pictures on the screen or in the near-point card holder and he is told that you are just going to look at him while he looks at the pictures, he at least knows the retinoscope is not going to be shoved into him.

At this moment it is important to state that all comments to the child should be very carefully phrased. Immediately above, the suggestion was made that you say, "I'm going to look at you while you look at pictures." Please remember that the child remembers what he heard last. If you say, "You look at the pictures while I look at you," the child will probably remember what you are doing and forget the pictures. The last thing said should be what you wish the child to do.

When using the test lenses it is helpful to call them little windows. Previous experience with windows lets the child know that the trial lens is not going to be stuck in his eye, and he will usually lean forward to peer through the trial lens. It is important that there be as little contact as possible, but if the child wishes to get close to the lens and leans forward to get a better look through it, your hand against his forehead will ease him back into a more satisfactory position.

Many very young children will allow the use of trial lenses during retinoscopy if given one to hold in their own hands. Many optometrists use an old scratched up extra trial lens for this purpose. Frequently the manner in which a child attempts to imitate the test use of a trial lens can be most informative. All of this byplay with a trial lens can set the stage for the use of prism and red glass or an occluder in later tests.

Another item, which is useful but not essential in the examining room, is a bulletin board. This should be placed near the examining unit. You will find that you wish to make frequent use of it with adults for certain material distributed by the Optometric Extension Program. It is equally important with children and should contain a few of the drawings that children bring to you. These drawings can be utilized in conversation with the child, and many children comment about the coloring work that other children have done. Furthermore, it gives you information regarding the child's perceptions and experiences with coloring books.

You should always remember that the most enormous and obvious piece of equipment found in the examining room is <u>you</u>. The way you move around, your tone of voice, and the expression on your face can do much to establish comfort and cooperation when working with children.

All movements should be slowed down. This does not mean that you move at a snail's pace, but it does mean that sudden, startling movements should be avoided. You will make more progress with slow, easy

movements than you will with hurrying to get each test done. If you seat yourself directly in front of the child to do the dangled bell test, move in slowly. If you do not work sitting down, approach the examining unit slowly enough so the child can keep his eyes on you. Characteristically, small children do not have good ocular pursuits, and if you move too quickly and the child cannot follow you, he will become startled and will not be ready for the test situation. If you are directly in front of the child, either seated or standing, and must reach to the equipment stand for a trial lens or even for the dangled bell, move just a little off the child's midline so he may anticipate the direction of your arm movement. Whenever you must place yourself directly in front of the child, do it gradually to avoid his feeling that you are closing in on him.

Your tone of voice is of great importance. Speak lowly and slowly! Actually, this is a splendid rule to remember with all patients, and even the adult will follow instructions and give better responses if you speak slowly enough so that he can follow you and lowly enough that he feels this is between the two of you. Children often respond to whispering more readily than they do to a normal volume of voice. Children who say nothing and who are reluctant to speak in any test situation will frequently reply in whispers when whispered to.

What you say has already been mentioned, but further emphasis should be given the manner in which you phrase your questions. Your choice of words is so significant in eliciting proper responses that the next paper in this series will deal with this aspect of the examination. This will apply to adults as well as it does to children, and if you will utilize these suggestions and adapt them to your method of examining, they can be very productive.

Your facial expression can win or lose a child. Children can spot a phoney a mile away. Do not practice an artificial smile to be used only for children. Children are very adept at reading facial expressions, because they govern their daily behavior at home by the expressions they see on their parents' faces. If you are interested in children, it will show in your facial expressions, and they will warm up to you immediately. If you use baby talk or lovey talk to children, your facial expression will be artificial, and they will see what you are saying rather than hear what you are saying.

This paper has been directed at making a child comfortable in the refractive room. All of these suggestions are adaptable to the adult. The small chair beside your refracting unit, the chalkboard, the desk, the bulletin board, all give you opportunities to talk about the importance of preventive visual care. When you are working with a child, they give you the opportunity to demonstrate the importance of vision and to elicit visual performance from a child who is cooperative because he is comfortable.

VOLUME 32 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

"WORDS CAN BE A TOOL OR A TRAP"

January - 1960

Series 4 No. 4

In the December paper a comment was made about the choice of words and the significance of words in eliciting proper responses from a patient. The Questions and Answers Series prepared by Dr. S. K. Lesser, which comes to you in your monthly envelope, is now discussing proper instructions to patients. Dr. Lesser states in his November, 1959 paper, "Proper instructional set eliminates confusion and builds rapport." There is no intention to duplicate Dr. Lesser's discussion in this series on Operational Vision. However, there are a number of comments that can be made about words and phrases which can be used with young patients to obtain more adequate communication during the examination.

A remark has already been made about phrasing your sentences so that the last thing said is the instruction to the patient. Sometimes the shy or unresponsive child has difficulty following a direct instruction. This problem can be met by carefully phrasing your instruction or question so the child has a choice of answers. It would be wise if you would write out each of your usual instructions to your child patients and examine them carefully. It is very easy to fall into the trap of phrasing your instructions so the young child will give you an affirmative response to the last thing he heard, rather than making a discrimination that will let you determine his performance. For example, if you are running a subjective, and you say, "Is this better or is this better?" as you change lenses, he may give you a yes answer to the last change whether it is "better" or not. Many children wish to be cooperative and agree with the examiner's question just because they think they should. Sometimes it is surprising that the very young child can make a differentiation and give an adequate response to the instruction which is phrased, "Which of these is easier to see?"

Another trap can occur in taking visual acuities. When the question is asked, "Can you see those letters?" occasionally the alert child will say "I can see them but I cannot read them." The child who is not so alert may say, "No, I cannot see them," when he actually means that he does not know his letters so he cannot tell you what they are. This problem can usually be avoided if you state your question as follows: "Are there any of those letters you know?" or "Are there any of those letters that are in your name?" Phrasing the question in this manner avoids putting the child into a can or cannot situation. This is especially important if you are dealing with a non-achiever, who is already aware of his inabilities in the classroom.

Probably no other analytical tests give rise to as much confusion as taking of #14A and #14B findings on young children. Most young children cannot discriminate the just noticeable difference that makes either vertical or horizontal lines appear blacker. #14A is considerably more difficult for the young child because the demand for awareness of two charts is added to the demand for discrimination of blackness. The surest way to get an affirmative answer from a child is to phrase your question, "Are the up and down lines blacker now?" If such a question is used, the chances are about nine to one that you will not get a discrimination of which lines are blacker no matter how long you probe nor how frequently you ask your question. It is definitely better to ask, "Do the up and down lines seem blacker than the across lines?" This, however, still presents an opportunity for a congenial or co-operative answer rather than an actual statement based on the patient's

judgments of which lines are blacker. In working with children through third grade levels it is usually best to phrase your question, "Which lines were drawn with the blackest pencil?" Occasionally children do not have an adequate concept of the words necessary to describe which lines are blacker. If there is any suggestion that the child is not sure of the words he should use, asking him to point or to move his finger the way the blackest lines run will let him respond and give the information you are seeking.

It is always important to remember that most children can illustrate with their hands more adequately than they can choose the proper words for difficult discriminations. Having a child draw the letters of the acuity charts "as if he were writing them in the air" will allow you to determine acuities most satisfactorily. The same is true on phoria tests, and if you ask the young patient, "Point to the high one--now point to the low one," you can determine by the direction of hand movement when alignment of the charts is reached. A child should be allowed to use his hands whenever possible during an examination. This will consistently bring about more participation and results in a more "co-operative" patient.

In the past several years the importance of the SILO findings has become more apparent to everyone making an examination of operational vision. Here we especially find that improper phrasing can create a confusion for many children. If the question is stated, "Are the letters getting larger or smaller?" some children will say, "smaller," because this was the last word they heard. Other children will merely reply with a "no" because they know that letters do not change size once they are printed on paper. One child in particular reported recently that the letter chart was not moving either toward him or away from him because "Everybody knows that wall does not move." If the question is phrased, "Do the letters <u>seem</u> to change in size?" your patient can immediately understand that it is not unusual if they do appear to change. The question can also be phrased, "Does the chart look different now?" and even pre-school children can report that it looks smaller or larger, or is changing position.

The instructions you give to a child before taking ductions can determine his response. It is frequently surprising at what an early age you can get a reliable duction finding if you phrase your question so the child understands that he <u>might</u> see two targets. However, if a child is simply instructed, "Tell me when you see two," it is possible to miss the break-point by many prism diopters. If you wish to take duction findings on a small child, do your best to keep his attention upon the target with a running series of questions. The moment the rotary prisms are introduced, it is wise to take a moment and say, "Are there any letters there that are in your name? Watch those letters and tell me if they seem to get hard to see." As you continue to introduce more prism, say, "Do they <u>seem</u> to be changing size--do they <u>seem</u> to be moving--are they still easy to read?"

When enough prism has been turned in that you might suspect a breaking point from your observations of his performance on dangled bell, start saying, "Does it still <u>seem</u> to be one set of letters?" If the child hesitates in answering this last question, you can ask, "Does there seem to be more than one set of letters?" Frequently if the child has reported, "Yes, the target is moving," it is wise to ask, "Which way is it moving?" Many children will spontaneously bring their hands in to illustrate the direction of movement, and you can immediately determine by the child's action whether he should be seeing one target, nearer or farther away from him, or a target shifting to the side. In this later circumstance you might say, "Look around and see if you find another set of letters somewhere." If he then reports two, you can complete the duction test with the instruction, "Tell me when the two lights make just one again."

All patients have difficulty with some of the optometric tests and especially so if they haven't experienced them before. Under these circumstances it seems very permissible to repeat the test because, having experienced it, the patient will know better what to expect and will be able to follow your instructions more adequately a second time. It is never safe to assume that a child suppresses or suspends one eye just because he fails to see two tar-

gets on a duction test. Again it is well to recall that the duction finding should show a performance comparable to that on dangled bell. If fixations and pursuits are very inadequate, a failure in a duction test could be expected. Perhaps a duction test should not even be attempted if dangled bell responses are extremely poor. When fixations and pursuits on the bell are adequate, and responses on duction tests seem very inadequate, the late Dr. Selig Hecht's famous remark should be recalled. He observed that if the guinea pig gives you the wrong answer, you should doubt your question, not the guinea pig.

Thus far in this paper the discussion has concerned a few of the usual analytical findings as they pertain to the young patient. In the December paper the comment was made that proper phrasing would apply to adults as well as it would to children. All of the above questions or instructions can be used with every patient. Too frequently the examiner's familiarity with the tests leads him to think that the patient is also familiar with the tests and should be able to give proper answers in every situation. It is important to realize that no matter how frequently we have done an examination or a progress report on a patient, his visual abilities may have changed enough to make a particular test very difficult. As instructions and questions are more clearly stated, responses and interpretations will be more clearly expressed by the patient. Regardless of the age of the patient, his confusion can be reduced if every examiner will say what he means instead of what he thinks he means. Again, the careful examination of your usual questions to the patient is in order. As suggested above, write down your instructions as you have been giving them and examine them carefully for ambiguity or double meanings.

There is another aspect of your conversation during the examination which needs careful consideration. If you are working with a child and wish to make particular comments to his parents regarding his visual performance, you should be extremely careful about your statements and how they sound to the child. If the youngster cannot fixate the dangled bell with both eyes, and you turn to his parents and say, "Johnny cannot look at the bell with both eyes," Johnny might think, "That man is wrong--I am looking at the bell." It would be far better to say, "Johnny's eyes are having difficulty keeping pointed at the bell." Or you may say, "Johnny's eyes do not point at the bell as a pair of eyes should." These two statements take the blame off Johnny and put the blame on his eyes. If the words used in a situation like this are not carefully chosen, even the parent might say, "See, Johnny, I told you, you do not try," or "Johnny, do what the doctor tells you to do."

It is important to convey to the parents and to Johnny that he is doing the best he can but that the problem is such that his efforts are inadequate. It is important to use every possible situation during the examination to convey to the parents what the child's problem really is. If statements are phrased in operational terms, communication between examiner, parents, and child will be improved. It is frequently very wise to report your observations to your assistant in these same operational terms. In spite of the fact that there is an urge to demonstrate the broad extent of our optometric knowledge concerning children with fancy words, people must still be dealt with as people and not as someone to be impressed. For example, if on dangled bell your report is, "This child lacks convergence ability; O.D. deviates; cannot recover binocularity without tactual support," the parents might immediately think their child needs the attention of a "specialist." On the other hand, if you report, "Johnny cannot hold both eyes on the target; right eye turns outward but hand assists eyes to locate and look at bell," the parents immediately have an idea of the difficulty their child is experiencing.

This is only one example, and many paragraphs could be written with specific examples to fit every test. Analysis of the phrasing you use will let you state your questions in a manner consistent with your own personality, and it is not the intent of this series to put meaning-

less words in your mouth.

The conference with parents following the examination of their child will be considered in next month's paper. Each test will be explored for its possibilities and uses in making the conference more meaningful. In preparation for this you are again requested to sit down and write out the language you use and examine it carefully before another day goes by. This will allow you to understand operational vision better and to communicate to patient or parent with more understanding and meaningfulness.

VOLUME 32 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

"TALK THE PARENTS' LANGUAGE"

February - 1960 Series 4 No. 5

Dr. A.M. Skeffington has often emphasized the importance of talking to patients in a language they can understand. Dr. Ralph Barstow has frequently said, "Talk the patient's language." When an optometric examination is being made on a child, a very real opportunity is provided to talk the parents' language. This also means that their normal parental concern for their child must constantly be recognized by the optometrist. The January paper in this series suggested that the phrasing of the questions put to the child could make the difference between success and failure in the examination. It is equally true that the phrasing of side comments to the parents while the examination is being run can make the conference to follow a success or a failure. At no time during the examination should an opportunity be missed to convey information to the parents.

Most parents are carefully watching every move you make because THIS IS THEIR CHILD, and they are submitting him to you after careful consideration. It cannot be fully established that parents sit down and discuss all of the pros and cons of each clinician available to them. It is wise to think, however, that parents have made a careful analysis of their child's problem and of which clinician is capable of giving them help. Even if parents were not known to be this thoughtful, it would be wise to think they are. The effort will then be made to communicate more adequately during the conference following the examination. If it is assumed that this analysis has taken place, the work with the youngster will be done more carefully, and so will create a rapport with the parents that will make the conversation with them more meaningful and more effective.

The January paper stated that each test would be explored for its possibilities and uses in making the conference more meaningful. Previous papers have repeatedly stated that all observations should be reported to your stenographer in operational language. The comments that can be made regarding each behavior can contribute to the parents' understanding of their child's problem. The moment the child climbs into the examining chair the conversation with the child can denote the purposes of the tests to follow. The language you choose should be understandable to the child, but your phrasing should be directed to the parents.

Let us assume that Johnny, age six, is brought to your office because of difficulties in first grade. The interview form has been returned, and you have discovered that Johnny is a typical 1960 model and is "smart in everything but school work," with particular difficulties in reading. The conversation might run as follows:

"Sit in this chair, please, Johnny. This is kind of a special chair just for the many boys and girls like you who come to this office. It is special so you will be comfortable and so you can see the pictures and letters we are going to use while we find out how your eyes work. While we are doing this we will want you to tell us just how things look to you so we can find out how to make your school work easier and more fun.

"First of all, Johnny, I would like you to look at this little bell. Watch it as carefully as you can so I can see how well your eyes work together."

If your observations of a child indicate poor teaming, a lack of fixation ability, or a lack of pursuits, you might take this opportunity to illustrate the ocular in-

adequacy to the parents. Call them over to the examining chair and have them stand directly behind you. Urge them to watch their child's eyes as you repeat the tests. You can count on the child's cooperation if you emphasize to him that you want him to show his mommy and daddy what his eyes are doing. After the test has been repeated, turn to the parents and ask them what they saw. If they were not observant enough to see the erratic eye behavior, point out to them very briefly what they should watch for as you repeat the test a third time. When they express their surprise--as they usually do--you can then comment that all school work, and especially reading, demands full control of eye movements.

You can relate this to reading, where eyes must move smoothly across the line of print; you can relate it to workbooks, where eyes must move quickly and accurately in every direction over a page; and you can relate it to copy work, where eyes must shift from workbook to blackboard or to teacher quickly and efficiently. You can also comment briefly that if a child's eyes will not move in a straight line, the child may have difficulty seeing a straight line. You can further mention the clinical fact that when a child does not have adequate control of eye movements, he loses comprehension long before he reports blurriness or doubling. Frequently parents make some comment after observing erratic ocular movements, and it is not uncommon to hear them say, "No wonder he cannot keep his place when he reads," or "No wonder he gets mixed up in his workbooks."

Do not get carried away with the parents' sudden interest. Remember Johnny is still sitting there, being looked at and being talked about. You might turn to Johnny and say, "You know, Johnny, we do a lot of work with children who are having a little trouble getting started in school. We like to work with boys and girls like you because we know that they are smart, and you have already shown us that you know all of your letters. I know that we can help you to get those eyes working better so you can learn to read just as well as the other children do. We know that it is just because your eyes are clumsy, because you have already shown us how well you can see even the littlest letters."

By now the parents have had a chance to identify the immediate problem. Your conversation with the child has let them know that Johnny sees all right and that he can have help. It is usually wise to save further conversation until the examination is completed, and you can be quite sure that the parents will be most interested in everything you do after this.

The information you want the parents to have while making your retinoscopic observations should be conveyed by the words you use in recording. You can immediately relate your retinoscopic observations to the performance seen on the dangled bell in many cases. If, for example, the child's left eye could neither fixate nor pursue the dangled bell, it would not be surprising to find that the retinoscopic reflex in the left eye was unstable and variable. The parents will hear <u>what you mean</u> when you say to your assistant, "Left eye does not hold focus--dulls as if it were not working with right eye." You may then continue to give more detailed and technical information for the record, but what you have already said will have made its impact upon the parents.

Before you start the vertical prism test, a comment to Johnny is usually in order. It might go something like this, "You're sure a good patient, Johnny. Do you know what a patient is? That's a boy, or a girl, or sometimes a mommy or a daddy, that comes to this office so they can get the kind of help that will let them see better. You are a good patient because you have helped me by doing all the things I have asked you to do.

"Now we are going to do some things that will be a little more fun. What I'm going to do next will seem like a trick or sort of magic, but it really is not. This little piece of glass, that looks like another little window, will tell me if both of your eyes work all the time. Now while you're looking through it, I want you to tell me how many lights (or moons or balls) you see over there across the room."

This is another test where demonstration with the parents can be very effective. You can stop, turn to the parents, and comment that this is a very simple but probably one of the most significant tests we can make, because regardless of age it

tells us whether or not a child is using both eyes. You can further state that this test is effective on infants as young as six months because even when they cannot count to two, the vertical movements of their eyes indicate whether or not they are aware of two lights. You might wish to demonstrate before the parents' eyes, and as you hold the prism in position, you can quickly show them that it takes two good eyes for diplopia. You can emphasize this by stating that a one-eyed man cannot see double in this test except in rare and serious cases. This little demonstration will convey to the parents that even though their child's left eye may not be teaming with the right eye, it is not a blind eye. You can return to the child in the examining chair with another comment that here again we know their child just needs some help in learning to gain control of his eyes.

Once again, it is wise to remember that when the child is discussed with his parents, some remark should always be directed to him that will keep him comfortable and aware of the desire to help him. Every child likes to know that someone wishes to help him, and each time this is stated, he will think of you as someone special and someone very interested in him.

The red glass test is more difficult for many children. If you are working with a youngster who has already shown you poor teaming and variable retinoscopic reflexes, the chances are that he will not be able to report a single pink light. When making this test some caution regarding your remarks is wise. The instruction to Johnny might run as follows: "Now you are going to look through another kind of window, and I would like you to tell me just what you see--just like you have been doing on the other things we have shown you. You are such a good worker and you are helping me so very much, I know you will be able to tell me something about that light over there on the wall (or the near-point light, as the case may be)." In both the red glass test and the pen-light pupillary response test further information regarding a lagging or clumsy eye can be conveyed by your choice of words in reporting to your assistant. A comment about sluggish pupil action need not be elaborately explained, because the parents have already been alerted to the fact that the left eye is not working adequately.

The book retinoscope test provides a splendid opportunity to visit with the child. The comments you make when you hand him the book can put him at ease and bring his interests back by letting him see more familiar material. The comments that you make to your assistant can place another thought in the parents' minds and further prepare them for a conference discussion. These comments might run as follows:

"Johnny's visual performance on this test is more adequate when he is looking at familiar pictures. His left eye still appears to shut off but is in better focus when Johnny points at details. This indicates that he receives support to vision when he uses his hands in cooperation with eyes." You might wish to turn to the parents at this point and say something about the importance of this hand support. You might wish to state that this is a clue regarding the reason why his workbook achievement at school is more satisfactory than his reading. You can suggest to them that he sees better when hands are also being used, and, as a result, he accomplishes more in activities which demand eye-hand cooperation.

The circus formboard has been included in the basic visual development test sequence for a number of reasons. Many of these have been explained previously in this series of papers. Probably the major reason for this test is that it allows the child to leave the examining chair, move to the desk or table, and do something where his success is assured. The type of youngster used for an example in this paper will probably sail through the circus formboard with ease. If, on the other hand, he has difficulty placing the pieces in proper position, you can call the parents' attention to the fact that a child who has difficulty judging little differences in size or shape of these pieces will also have difficulty in visualizing many of the words he must learn

in school. If he cannot immediately recognize the differences between the clown and the strong man, or the trapeze artists, he probably will not recognize the differences between "in" and "on" or "the" and "they." Most parents will immediately see the relationship between size and shape of these pieces and the size and shape of words. If they do not, you can take a moment to put these words on your chalkboard to illustrate that no matter how clearly one sees, information comes out of the details which determine the little differences.

At this point in this paper someone may be saying, "I thought this paper was going to discuss the conference with the parents." The conference which follows an examination can only be successful if the parents have an understanding of their child's problem. All parents demand to know why their child is in trouble before they will buy any program of guidance or care. First of all, they need to realize that they made the right decision when they made the appointment. It is impossible to tell them that they made the right decision. They must be shown by the manner in which you uncover the difficulties that relate to the child's lack of success in school.

The actual post-examination conference can be shortened and made more effective as you illustrate the visual difficulties that do exist. It is not unusual to have parents tell their optometrist what the problem is and what should be done for it if proper communication has been established during the examination. All of these opportunities to demonstrate the problem are as much a part of the conference as the actual across-the-desk conversation. Next month's paper will continue the discussion of these opportunities as they can be found in the advanced sequence of tests.

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

"TALK THE PARENTS' LANGUAGE" (Continued)

March - 1960 Series 4 No. 6

The advanced operational vision tests are becoming significantly more valuable to all those who are using them. These tests were designed to allow the optometrist who administers them to really see vision as output. All of the tests of visual performance that have been developed over the years by optometrists are tests of output, but none of the standard tests will let you see the gears grind and mesh within the visual mechanism as will the eight tests described in Section II of the manual published by OEP, 1959, "Techniques and Diagnostic Criteria for the Optometric Care of Children's Vision." As further understanding of visual development and visual processes is gained, these tests become demonstrations of the child's ability to understand the world about him by his visual interpretation of it. Because each of these tests is a demonstration, there are many opportunities to communicate with the parents during the examination.

The manual you received as a Christmas bonus from the Optometric Extension Program states that the Spontaneous Drawing Test is probably one of the most important tests. It reveals information about all visual judgments: size, distance, perspective, depth, relationships, direction, visualization, etc. Each of these details will be present to some degree in any drawing the child puts on paper. After the child has completed his drawing, a few comments regarding the illustration will stimulate more careful observations of the child's performance by the parents in the tests to follow. As the child is making his drawing, the optometrist can note the particular aspects that illustrate the child's familiarity with his world because of his observations of it. What the child puts on paper will be in direct proportion to what he has seen. This fact has been established by a number of investigators, and it should be so stated to the parents.

If the child draws a house, and the details are not in proper proportion, it is reasonably safe to assume that he does not have good visual interpretation of size. If the child's drawing is a very poor representation of what he names it to be, some comments should be made relative to his inability to visually interpret the details that contribute to an adequate perception of the object he tried to represent. Very frequently in circumstances such as these parents will remark that their child has never been good at drawing. The presents an opportunity to explain to them that this is not a test of artistic ability, but it is a test of whether or not a child can reasonably reproduce on paper something he has previously seen. Further conversation regarding this test should be saved for the post-examination conference, at which time you will probably wish to comment about the importance of words as symbols for things just as line drawings are also symbols for things.

In your report to your assistant comments about the rigidity of hand and the tightness with which the pencil is grasped can give the parents a clue to scribbling or inaccuracies in workbooks. If, on the other hand, you report a freedom of hand movement and an adequate drawing, your comments to the child might be similar to, "This is a real nice picture, Johnny. I can see why you like workbooks and can do such good work in them."

This series of papers has repeatedly discussed how important it is that a child has developed a body scheme. The Incomplete Man Test has been borrowed from a battery of psychological tests. Optometry now recognizes that all learning comes out

of movement of one's self through space. Parents will frequently wonder and will often comment about this test because they do not immediately recognize its importance to vision. If a child does not know the purpose of his arms or legs, he will have difficulty manipulating them properly. If these difficulties do exist, there is an excellent chance that he does not know the purpose of his eyes. This test can be used to illustrate to the parents that a child must have a knowledge of his movements and must have some skill of movement in total body before he can gain it in specific areas such as eye movements. Optometry is not interested in the emotional aspects of this test as other professions are, and the basic purpose should be conveyed to the parents, should they wish to go into detail during the conference.

There is extensive literature on the geometric forms, which are described in the manual as Visual Forms. These forms were first utilized by optometrists nearly 12 years ago and have always been of interest to the parents as they watch their child copy each pattern. If it were not for the diagnostic significance of its position in the sequence, it would be an excellent starting test because most parents tune in very quickly on this test. As a rule, your remarks to your assistant will convey much information to the parents: "Johnny's circle is smooth and of comparable size. His plus sign is quite well divided, and the lines are of acceptable length. His square is slightly rectangular but acceptable. His triangle illustrates considerable difficulty with diagonal directions, as was previously illustrated by jerky eye movements in the diagonal directions." At this point you may wish to turn to the parents and say, "We believe that it is generally impossible for a youngster to see and understand a straight line if he cannot draw a straight line. If eyes will not move in the diagonal direction, a child's diagonal lines on paper will be poor, and this can interfere with his achievement in workbooks."

The Tactual Forms is another test which arouses the parents' interest. Most parents have not stopped to realize that everyone has daily experience in visualizing the objects he handles. The ability to feel what a thing would look like and to see what a thing would feel like* can be closely related to spelling achievement in the classroom. This can be brought to the parents' attention by asking them to identify something in their pocket or purse without looking at it. Any you might comment, "The look of a word and the feel of a word are both necessary for an 'A' grade on a spelling paper."

It is not as essential to make comment directly to the child during these tests as it is in the basic test sequence. Most children enjoy these tests so very much that the fun they have outweighs any comment you might be making to the parents. If, however, a child is failing a test, you should convey to both the child and the parents, "This has not been well enough learned, and there are games he will enjoy which will help him develop the underlying skills."

The child's performance on the Sized Blocks needs very little explanation. Most parents are immediately aware that their child is not recognizing proper sizes. The only comment you need to make can be made directly to your assistant, "Johnny cannot visually interpret sizes unless the difference is obvious, and he must frequently return to the feel of the sizes in matching them to be sure. He has more difficulty making visual judgments of combinations than he does similar sizes but does well in recognizing the sequence of sizes to complete the stairway." You might now turn to the parents and say, "This test gives us much information regarding your child's number concepts. Many children have difficulty learning that numbers must represent size and distance as well as quantity. Number concepts require the ability to visualize sizes, and if a child cannot see actual size and differences of sizes on these blocks, we know that he has difficulty visualizing what numbers stand for."

The Key Form Board also illustrates to parents that their child must see the little difference that counts. Parents will recognize that the keys are all alike and usually expect their child to do very well on this test. Those parents

*From "Mommy and Daddy, You can Help Me Learn to See," Published by AOA Auxiliary.

who have had difficulty keeping silent during the previous tests will usually make some remark here about how easy this test ought to be. They have done their best to make no comment up till now, but because this test looks simple, and because they can restrain themselves no longer, they may talk to each other while these materials are being placed before the child. If you suspect that the child will have trouble with this test as a result of your observations on previous tests, you might ask the parents to watch for reversals. "Let us pay particular attention to how the pegs are placed as Johnny inserts each one." This will alert them to the possibility of a reversal, and if it occurs, some remark about Johnny not being sure of direction can be made for further discussion later.

The Form Boards are similar to the Visual Forms in that parents will see how their child goes about solving the task. If the child places each piece quickly and easily, your report to your assistant can convey meaningful information to the parents. "Johnny immediately recognizes similarities and differences. He had no difficulty with the square and rectangle and immediately made the proper visual judgment of the difference between these two pieces." If, on the other hand, the child has considerable trouble placing similar pieces in proper position, a brief explanation to parents is in order: "Johnny had a little difficulty seeing the difference between the square and rectangle, and the differences between the halves of the diamond and the halves of the square. This would suggest to us that he might also have difficulty seeing the differences between similar words, because after all, there is much similarity between these shapes and the shapes of words. If he cannot see the differences in solid shapes such as these blocks, we can expect that the abstract shapes of words on paper could be difficult for him."

It is impossible to refer to the multitude of individual differences that will be demonstrated on these tests. This paper has attempted to call certain possibilities to your attention so you can use these tests for parent-optometrist communication. Each new child in your office and each progress report examination on the same child will give you more and better examples than can be given here. If you guide the parents' thinking with brief side comments, they will begin to realize that Johnny can have a visual problem without having an eye problem.

Many of the men around the country, who are using these tests, report that they are utilizing various methods for parents participation. Some give parents a blank sheet of paper and a clip board so notes can be written by the parents as the examination progresses. At times these notes are dictated by the optometrist as items for further consideration during the conference. Others ask parents to write their questions for discussion during the conference rather than interrupting the examination as it proceeds.

As soon as the examination is completed, Johnny should be asked to go to the play table in the reception room. If you are using the Blockraft, he can be asked to build something while you visit with his parents. In the large majority of instances it is best that the child be out of the room during the conference. There will be times, however, when you may wish to have the child sit quietly in the examining chair or at the examining desk while the case is discussed. At times even the child with the most obvious problem can participate in the conference and be present while you discuss the training methods that will be of assistance to him. The fact that he has failed in so many things up till now need not be a deterent to his participation. If you can be sure that he can be helped, and you wish to emphasize this to him, you may wish the child to stay in the examining room for further demonstration, either of his inabilities or of the routines that you will prescribe for him.

For further illustration an actual case will probably convey the possible methods of making the conference with the parents most effective. In last month's paper it was assumed that Johnny, age six, was a typical 1960 model having difficulty getting started in school. Inadequacies in ocular teaming and a lack of adequate visual development were shown in most of the basic tests. The advanced test sequence shows a lack of development in

specific motor control and a lack of abilities in form perception with dependency upon hands to complete visual judgments. In general, it could be said that he has not progressed to adequate abilities of visual abstraction and visual synthesis required for satisfactory achievement in first-grade textbooks.

The actual conference with the parents might run as follows: "First of all, Mr. and Mrs. Jones, we should recognize the fact that Johnny has normal eyesight at distance--he reads the famous 20/20 line without difficulty. He is not sure of some of his letters, but this is not particularly surprising with many of the first graders I see. His eyes are healthy, and I find no evidence of disease, or pathology, present at this time. This means that Johnny's eyes are all right--the difficulty lies in his inability to use them as well as he should.

"When we optometrists use the word vision, we mean more than, 'Does he see or doesn't he see?' Vision to us means a patient's ability to interpret and to get meaning out of what he sees. This, of course, is of very great importance to Johnny in learning to read. All reading and all workbooks demand that our children understand the marks on paper as symbols for something real. This interpretation of what the child is seeing depends on previous experiences, how well he can control movements of his eyes, and his familiarity with the many things in his world. We now know that Johnny's ability to interpret what he sees is learned by him in the same way he must interpret what he hears, or which words to use when he talks. If a child's speech is poor, we parents are immediately aware of it because the child demonstrates his difficulty to us. If a child's vision is poor, we cannot see it unless we are aware of the mistakes he makes in interpretation--such as some of those you saw during the examination.

"One of the first things I saw during Johnny's examination today was his difficulty in keeping his eyes working as a pair. I know that there is nothing basically wrong with his left eye--it is a good healthy eye. Since each eye is normal, the difficulty lies in his failure to learn the teaming that is expected for adequate vision. I am sure you can realize that if Johnny could not move his eyes smoothly as he watched the little bell we used, he could be expected to have trouble moving his eyes across the lines of print in a reader. I showed you the difficulty he had in moving eyes up and down and in diagonal directions. This jerkiness will cause problems in visually searching for the words that match a picture in his workbooks.

"When I made actual measurements of his eyes, I found he was a little bit farsighted. This is normal for most children and is actually a good thing rather than a defect. However, I also found that his left eye would lose focus as he attempted to maintain visual attention. This inability can very definitely account for his difficulty on second and third paragraphs in his reader. If he cannot keep each eye in balanced focus, he will stumble more frequently as he continues to read. Even though Johnny could not report to us that his reading would blur, I know from clinical experience that he will have more and more difficulty comprehending what he reads when he has to continue through several pages of a reader.

"I found also that his near-point tests showed even greater difficulty in maintaining singleness and clarity of print. The proper lenses worn for all schoolwork--or anything similar to schoolwork can be of very real assistance to him. This will be discussed again later.

"The tests here at the desk were very interesting as illustrations of Johnny's problem in visual interpretation of likes and differences. Here he frequently demonstrated his need to use his hands to check what he sees. We in optometry have been telling parents that a child learns to see first with his hands and then with his eyes. I am sure you remember that Johnny had to feel nearly everything he looked at as if he were checking to be sure what it was. I saw him doing this again and again on the pencil and paper tests as well as the block and form boards.

"Johnny is basically a smart child. However, I must emphasize to you that he has a visual problem because he has not learned to use his eyes as he should for fullest interpretation of what he sees. Since this is a learned thing, Johnny can have a lot of important help. There will also be many things that you can do for him at home now that you are aware of how you can be of assistance to him.

"As Johnny's parents you may make a choice of one of four visual care programs to help him gain success in school."

Next month this series will discuss the presentation of alternatives and the optcmetric program for this illustrative case.

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

"THE VISUAL CARE PROGRAM"

April - 1960

Series 4 No. 7

The knowledge of what constitutes more adequate visual care for our patients demands an extension of our language to convey this information to the patients. The elaboration of techniques to investigate visual development has broadened optometric concepts of what constitutes adequate visual care. This knowledge and these techniques continue to emphasize the importance of vision in human performance. All of this, however, can lose its significance if we cannot communicate this information to the patient. This is especially true when an optometrist must explain a child's difficulties to his parents. Dr. A.M. Skeffington has frequently mentioned the presentation of alternatives when a program of visual care is being discussed. Dr. Skeffington has emphasized that the patient be given more than one choice, because an ultimatum is usually not well received by a patient. The organization and analysis of a case in preparing the alternatives is probably even more important than the psychological value of more than one visual care program.

The alternative sheet designed by Dr. John Streff of Pipestone, Minnesota, is being used to outline the program for Johnny -- the youngster who has been discussed in this series. It is filled out just as it would be if Johnny were a real patient, and his parents were sitting at the end of the consultation desk. A sample accompanies this paper so that you may use it for reference as you read the following discussion.

The problem has been stated as: "Inadequate visual readiness for school demands." You will note that this has been interpreted for the parents. The sheet states, "Johnny has not acquired the visual skills necessary for success in the near-point visual tasks of the elementary grades." At this point it is usually wise to again discuss the importance of the difference between "normal" eyesight of 20/20 and the ability to interpret what is read in the textbook. The parents should be reminded again that Johnny has difficulty in keeping eyes teamed and in moving his eyes smoothly and efficiently across lines of print. The difference between an ability to call letters on a chart at 20 feet and the ability to maintain visual continuity on the printed page should be re-stated. These are the basic visual skills that should be emphasized to parents again and again so they may understand that success in school is much more than 20/20 on a wall chart. If this is not clear in their minds, it should be discussed in operational terms--avoiding technical language--until the parents do understand.

The goals that we wish to achieve with every child having difficulty in school cannot be fully appreciated by adults unless they understand the difference between sight and vision. The goals listed on the sample alternative sheet should always be self-explanatory. Here also technical words should be avoided. These goals should be clearly stated and related to the problems of each child. The first goal listed for Johnny is more specific than the general definition of his problem. It beams the parents' attention to his problem in the classroom. Johnny has been described in previous papers as a first-grader having difficulty getting started in school. Since most adults feel that reading ability is of supreme importance, the first goal with such a child is so stated. The alternative sheet states, "To assist Johnny to gain the basic visual skills necessary for success in reading."

It is becoming more and more apparent to all optometrists working with young chil-

dren that eye problems will develop if visual problems are allowed to continue. This does not necessarily mean that if early visual problems are eliminated, eye problems will never occur, because no one can fully predict the many things that can happen to a child that will bring about an eye problem. Optometric skill and complete patient cooperation have not yet progressed to the point where every eye problem can be prevented. However, enough evidence has now been accumulated to indicate that the concessions of myopia and astigmatism due to near-point stress can be controlled. As a result, it is important to inform the parents that the second goal is "To assist Johnny to develop the visual abilities that can prevent eye problems in later grades."

Frequently the parents when hearing this statement will ask, "Do you mean Johnny won't have to wear glasses later?" It is important that this question be answered, and if it is not raised by the parents, the optometrist should bring it into the discussion. This provides an opportunity to discuss the difference between achievement lenses and corrective lenses. Parents should be told that achievement lenses will undoubtedly be utilized as long as Johnny is a student. The purpose of achievement lenses which allow him to carry the visual load demanded in his school lifetime, should be stated very clearly. The parents should know that these lenses are prescribed to improve his comprehension and to prevent the fatigue and discomfort of long study periods. They should know that a corrective lens is usually a crutch and can do nothing more than provide clarity for eyes that have lost it through loss of normal abilities.

If the youngster in question happens to be myopic, special emphasis should be given to the usual progression of myopia and the resulting increase in lens power when visual abilities are inadequate. Most parents will appreciate optometric attempts to halt this progression to thicker, more unsightly lenses if it is brought to their attention. Of course, it is not wise to promise parents that myopia can be cured or completely stabilized. They can be assured, however, that with more adequate visual abilities the myopia need not be the handicap that it is with so many youngsters. This second goal, as stated for Johnny--and that whic can be stated for most children receiving optometric care--will usually emphasize t parents the importance of progress report and continuing optometric care through th school years. As soon as parents realize that there is a possibility that properly worn achievement lenses can prevent the more radical refractive problems, they will be able to make better decisions as to the type of visual care program they wish for their child.

Most parents bring their child into optometric offices with a sense of urgency. They are concerned now about Johnny's difficulty in school. Their long-range concern about high school and college fo their youngster contributes greatly to this urgency. Although they want assistance now, they also want to know that wh is done for their child will be benefici to his future. In the case of our imaginary Johnny--a youngster with an achievement problem in first grade--the third goal tells the parents that you too are concerned with his future. The statemen "To assist Johnny now to acquire the visual comfort and ability that will assure him of the basics in academic subjects so he can succeed in high school and college," may raise a question, however. The parents may say, "But Johnny has not had any discomfort." Such a que tion can be answered by reminding the parents that failure is never comfortable, even though it may not be an actual head ache or eyeache. They should be further reminded that the discomfort of inadequa comprehension, which results in not know ing the answers when called upon by the teacher, is just as closely related to his visual problem as is a headache.

By the time the appropriate goals have been laid out for the parents, they begi to realize that optometric interest in children is much greater than a pair of glasses. They also realize that the optometrist is discussing visual performance and visual results rather than wall chart abilities. This frequently brings about the comment, "We have always know that Johnny could see well, and now we can understand why he is having trouble in school. We are so glad something car be done to give him help." When parents illustrate by these comments that they understand Johnny's problem, they are

ready to consider the alternatives available to them and what can be done about the problem.

The alternative sheet herewith gives a complete visual care program as the #1 choice. Some optometrists do not always give a complete program as the first alternative, because family circumstances, distances involved, etc., might eliminate it as the most suitable program. However, the general feeling among the men using this type of presentation is that parents should be immediately informed concerning the importance of a full care program, even though it might not be immediately suitable for them. Whether a complete visual care program is or is not the #1 alternative, parents should know that it is available, and it should include: a) a complete in-office visual training program to assure the acquisition of basic visual abilities under professional supervision; b) a carefully designed out-of-office visual training program under parent supervision; c) the proper lenses which can enhance achievement and comprehension in all academic activities, and d) comprehensive optometric care (properly spaced progress report appointments) for an established period of time, with continuing optometric observation and care throughout the school years. The fee, which is set for alternative #1 will be determined by individual professional judgment, but many optometrists are setting a comprehensive fee which covers the original examination, the visual training, and the original prescription. This fee covers the period of time laid out as the comprehensive care period, and the continuing care is paid for on an office call basis. Under these circumstances any prescription changes that may be necessary are paid for at the time they are provided at an additional laboratory fee.

It is important that each phase of this complete program of visual care be carefully emphasized so the parents understand why the fee is larger than usually paid by others for "just a pair of glasses." There has been adequate discussion of this fee determination by Dr. Barstow so that it need not be elaborated here.

The second alternative for Johnny should be presented to the parents as the type of program that will give him immediate assistance but will not give him all the help he can have. This program would include everything that alternative #1 provides except the in-office visual training. It will furnish the parents with the carefully designed routines for out-of-office visual training. It will provide the proper achievement lenses and the comprehensive care which includes properly scheduled progress reports. The continuing optometric care after the basic period of guidance can still be arranged on an office call basis. It is frequently wise to state to parents that if Johnny's progress under this program is not adequate, further consideration should be given to the in-office visual training recommended in alternative #1.

Alternative #3 would provide proper lenses and progress reports. If the youngster in question is similar to Johnny, the parents should be told that they should not expect significant changes in classroom performance from a pair of glasses only. The Johnny who has been described in this series will probably use his glasses until the novelty wears off. This youngster will be another one of those who "had glasses but they didn't do him any good." This should be brought to the parents' attention very emphatically, because they should not leave the optometric office with even a vague idea that a pair of glasses will solve Johnny's problem. The fee for alternative #3 will probably be considerably smaller than those for alternatives 1 and 2. It will be greater than the fee for alternative #4, however, because it should include whatever progress report appointments you wish to list in this alternative.

Alternative #4 is, of course, lenses only. This is a very inadequate solution to the problem in such a case as Johnny, but is a most important alternative to present to the parents. The fee for "just lenses" will probably be in keeping with known and discussed fees in your locality. This will give you an opportunity to emphasize the differences between optometric and non-optometric visual care. This illustrates to the parents that much more is available to them if they wish to give their child fullest opportunities for success in school. If properly discussed,

alternative #4 can be one of the most important aspects of the entire presentation of alternatives. Most parents will reject alternative #4 because they have already decided that the long-range goals are of much greater importance than whether or not their child gets a pair of glasses. The majority of parents will choose alternative #1. Whether or not they can afford it will be determined by their understanding of their child's problem and their concern with his classroom inadequacies. In most cases after a full presentation of alternatives the parents will choose whichever program you recommend, because they will feel that you have given them a choice instead of an ultimatum.

This procedure of presentation will undoubtedly increase fees, but it will also increase your responsibilities and your hours of work with children. Now that optometric procedures can assist you to meet your obligations if alternative #1 is chosen by the parents, you can be sure that more children will experience more success in more classrooms.

In summary, the most important aspect of presenting alternatives is the opportunity it provides for each optometrist to organize his thinking on each case. In stating and defining the visual problem that exists, you have taken the first step toward solution for the patient. In stating the goals that you are going to try to reach for a patient, you will have found a method of communication which conveys the importance of vision and its relation to academic and social achievement. In determining the alternatives you wish to present, you will have realized the breadth and depth of complete optometric visual care. The end result of all this will be the patient's recognition that optometric care is more than a prescription and results in more than clarity of sight.

NAME: Johnny DATE: 1960

PROBLEM:

Inadequate visual readiness for school demands.

MEANS:

Johnny has not acquired the visual skills necessary for success in the near-point visual tasks of the elementary grades.

GOALS:

1. To assist Johnny to gain the basic visual skills necessary for success in reading.

2. To assist Johnny to develop the visual abilities that can prevent "eye problems" in later grades.

3. To assist Johnny NOW to acquire the visual comfort and ability that will assure him of the basics in academic subjects so he can succeed in high school and college.

WHAT CAN BE DONE ABOUT THE PROBLEM? WHAT GOALS ARE WE GOING TO TRY TO REACH?

ALTERNATIVE NO. 1	ALTERNATIVE NO. 2	ALTERNATIVE NO. 3	ALTERNATIVE NO. 4
a) In-office visual training b) Out-of-office visual training c) Proper lenses for all academic activities d) Comprehensive optometric care (progress report appointments) through the grades, and e) Continuing optometric care through school years	a) Out-of-office visual training b) Proper lenses for all academic activities c) Comprehensive optometric care (progress report appointments) through the grades, and d) Continuing optometric care through school years	a) Proper lenses for all academic activities b) Comprehensive optometric care (progress report appointments) through the grades, and c) Continuing optometric care through school years	a) Proper lenses for all academic activities
Comprehensive optometric fee $00.00, plus laboratory charges	Comprehensive optometric fee $00.00, plus laboratory charges	Fee $00.00 plus laboratory charges	Fee $00.00
Continuing optometric care on "office call" basis	Continuing optometric care on "office call" basis		

VOLUME 32 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPERATIONAL VISION

A series based on optometric procedures of G. N Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

"A CASE IN POINT"

May - 1960

Series 4 No. 8

The last several papers in this series have discussed communication with parents as a means of conveying the importance of vision. Most of what has been stated heretofore has been clinical and office practice philosophy. The application of this philosophy is sometimes difficult. It seems appropriate therefore to present a case typical of the many children being seen by optometrists and characteristic of many youngsters in the primary grades.

The case chosen for illustration is more than usually appropriate because it illustrates the application of the developmental vision philosophy, the standard analytical routine, the alternatives, and training procedures. This child could only be cared for in an optometric office. First appraisal of the analytical findings would indicate that lenses were immediately indicated. Observations that were made during the standard analytical tests emphasize the importance of the developmental philosophy if children are to have the visual care in addition to lenses, so necessary in today's academic environment. Further, this case illustrates the use of the alternative sheet to convey to the parents the need for complete visual care. Finally, it illustrates the significance of visual training as a part of the program necessary for so many children.

Melissa is ten and in the 5th grade. The Parent Interview Form indicated that the parents felt a visual examination was necessary because Melissa was complaining of "eyestrain, itching and burning of eyes." The parents felt that this discomfort had come on very suddenly and had been occurring for about a month. This child had a severe case of measles at the age of seven, but all other health history was negative. Developmental history was normal with expected development in every area. General behavior was not unusual in any respect, but the mother was not quite sure about some of the details concerning handedness. She reported that the child used her right hand for eating, writing and drawing, but she further commented that Melissa was also very capable with her left hand. School history was essentially good, and the child's report card showed above average grades.

The Visual History was a bit more significant. There had been no previous visual care, but the child's complaints usually occurred after school or in the evenings with some homework. The mother had not noted any squinting or frowning except when Melissa's eyes were burning. The mother also reported that Melissa only read what was necessary.

On further questioning at the time of the examination Melissa's mother reported that the child had always shown symptoms of eye fatigue when ill or when running a fever. Although the child had only made specific complaints recently, she had always wanted her mother to get her a pair of sunglasses. The mother recently had a conference with the child's teacher, and the teacher had not observed any sag in achievement. When specific questions were asked about reading outside of school work, the mother reported that in the past month or six weeks Melissa had a sudden interest in library books and was reading more than she ever had previously. During this intensive questioning the mother realized that the discomfort reported by Melissa had definitely been related to the added reading load.

The Visual Abilities Series indicated no significant deviation from expected performance. However, Retinal Alternation was definitely lower than the norm and significantly lower at near than at far. After this test Melissa complained that

her eyes were tired and had to have a rest before continuing. Monocular Projections were also significantly lower than the norms. Melissa showed a separation of 68 instead of 85 at far, and a 52 instead of 65 at near.

In discussing the situation with Melissa previous to the analytical examination she reported that her favorite subjects were reading and spelling. Her hardest subject was arithmetic. When asked why arithmetic was difficult, she said, "I guess it is not really hard, but we are in fractions now." She disliked geography, and when asked if she disliked it because it made her eyes hurt, she said, "No, it is just not interesting." She reported that she liked to read if it was interesting enough.

She reported no blur at near, but she made a very important statement when asked if she noticed anything unusual after reading a long time. She said, "When I read awhile, it seems like the print moves from side to side. Sometimes it gets bigger and smaller while I look at it." Upon careful questioning she could not report that the print seemed to move nearer to her or farther from her. She stated that she did not have to reread for comprehension except in geography. When asked particularly about the ocular discomfort, she reported more eyeache than headache, and that it seemed to help to "squeeze lids real tight." She reported that she had no difficulty seeing the blackboard, and that she sits in the middle of the classroom.

Unaided acuities at far were: O.D. 20/25+, O.S. 20/20-, O.U. 20/20. At near unaided acuities were: O.D. 20/20, O.S. 20/20, and O.U. 20/25.

The Dangled Bell Tests showed that Melissa had great difficulty keeping eyes teamed. She had full range of movement in all meridians with no head turn, but she had to make frequent refixations. She could fixate the bell on midline, but release was very slow, and she would frequently have to blink to get her left eye realigned. The examiner noted that the eye behind the occluder (on acuities) turned in slightly, and monocular pursuits on the bell test were better than binocular pursuits.

The analytical findings were as follows:

#3.	14 eso.	
#13A.	11 eso.	
#4.	+.50 to +.75 O.U.	
#5.	+2.25 to +2.75	
#7.	+.75	
#8.	9 eso.	
#9.	10	
#10.	23/13	
#11.	6/-4	
#13B.	10 eso.	
#14A.	O.D. +2.75	
	O.S. +2.25	
#15A.	5 eso.	
#14B.	+1.75 O.U.	
#15B.	6 eso.	
#16A.	X	
#16B.	30/22 SO (Small, Out)	
#17A.	X	(All near-point findings through +.75)
#17B.	22/0 SO	
#19.	O.D. 3.50	
	O.S. 4.50	
	O.U. 2.50	
#20.	-1.25	16 eso.
#21.	+3.00	ortho.

The first glance at these analytical findings shows a very definite "B2" typing and a definitely indicated bifocal prescription. Of even greater importance, however, in this case are the observations made on each test. On #4 the reflex was variable with alternate brightening. On #5 the reflex was again variable with alternate brightening, and at times both reflexes would dull off. Number 7 showed very critical judgments of the amount of plus acceptable for 20/20. A +1.00 blurred her to less than 20/30.

When a vertical row of letters was projected for Nos. 9, 10 and 11, Melissa's acuity was not as good on this vertical strip as it was on horizontal lines, and a 20/30 strip of letters had to be used. Melissa had difficulty on #14A determining which eye was viewing the upper chart and which was being used to view the lower chart. She spontaneously brought in her right hand when describing the chart seen with her right eye and brought in her left hand when describing the chart seen with her left eye. She reported difficulty in making judgments of size distance change

on Nos. 16 and 17. She reported that she could clear the -1.25 on #20, but when she did, there were two charts.

These analytical findings were not difficult to obtain. Melissa was a very excellent patient. The variables observed in the retinoscopic findings and her confusion in #14A are even more significant than the "B2" typing. These difficulties were conveyed to the mother by the manner in which they were reported to the assistant who was doing the recording.

The difficulty in teaming was illustrated to the mother by asking her to stand behind the examiner and to observe the refixations that Melissa had to make on the bell and when the occluder was removed. To further convey the problem to Melissa's mother, +.75 trial lenses were placed before Melissa's eyes, and she was again asked to fixate the far-point chart. One eye was occluded, and there was no deviation of the occluded eye. She did not have to make a refixation when the occluder was removed.

At near, however, she still had difficulty through the plus, and overholding was still evident. A +1.50 was used as a near-point lens, and there was a deviation of either eye when occluded. When the occluder was removed, she had to make an outward movement to fixate the bell. This behavior was shown to the mother to indicate the need for something more than a pair of glasses. At the same time Melissa's response to some plus at far and increased plus at near was clear enough that her mother could realize the need for a bifocal prescription. To further illustrate the importance of a bifocal, Melissa was asked to view the wall chart through +1.50, and of course she reported it very blurred. Her mother commented that she knew some children were given bifocals, and now she could understand why.

Melissa was excused from the examination chair, and the alternatives were laid out to her mother. The problem was stated as an inadequacy of visual skills and basic visual abilities for the school demands. These were defined as meaning that Melissa had not acquired adequate teaming of eyes, and as a result under continued stress of reading she was already beginning to show the tendency to depend on one eye. The goals were laid out just as they were for Johnny in last month's paper.

Mrs. C. was given four alternatives. Alternative #1 included the proper lenses (bifocal) for all school work and all near-point activity at home. A series of In-Office Visual Training sessions was explained, and Mrs. C. was told that this would involve at least three visits per week to the office. A program of Out-Of-Office Training was described and illustrated with Melissa's cooperation. Comprehensive optometric care, which would include progress reports and observations until Melissa was well into sixth grade, was also included in this first alternative. A total fee was set to cover this program, and it was explained that this fee would cover everything except repairs or lens changes.

Alternative #2 presented the same program <u>except</u> it did not include the series of In-Office Training sessions.

Alternative #3 was a pair of glasses with single vision lenses and no further care nor observations. The fees on Alternative #2 and Alternative #3 were set in keeping with usual fees in this area. Care was taken to explain that the fee in Alternative #3 was the usual cost of a pair of glasses when obtained from a nonoptometric practitioner.

A fourth alternative was given Mrs. C.when she asked what would happen if nothing were done for Melissa. The observations she had made of Melissa's difficulty in ocular teaming, the instability of "focusing" as reported during the examination, and the evidences that Melissa was beginning to supress one eye under stress, were all called to her attention. She was told that when these ocular difficulties existed, we could anticipate more severe discomfort and the possibilities of further one-eyed performance as the school load increased in the next seven grades. She was also told that no one could be sure that Melissa would become entirely one-eyed, but there could be very little doubt about the risks which would involve lower achievement in all school work.

After careful consideration, the alterna-

tive Mrs. C. chose was Alternative #2. They live about 26 miles from the optometrist's office, and school bus schedules and spring work on a farm all made three office visits per week very difficult. Both Mrs. C. and Melissa were then told of the importance of the Out-Of-Office Training, and that consistent daily periods of time should be set for this work. Their responsibility was discussed and acknowledged. The program for complete visual care was then laid out, and it was agreed that progress reports would determine whether or not In-Office Training should be undertaken during vacation.

Home Training Routines were prepared for Melissa. Each step was practiced so Melissa understood what she was to do. (An exact copy of the material mailed to Melissa is included with this paper.) It was again discussed with her at time of prescription delivery to be sure there was no misunderstanding.

The booklet, "How to Develop Your Child's Intelligence," was given to Mrs. C. with specific routines checked for Melissa. Mrs. C. was instructed to read the entire booklet and then review and give special attention to the routines marked with a red pencil. The basic coordination routines, chalkboard routines, hand-eye routines, and the visual perception routines were all checked as applicable to Melissa's case.

This youngster was brought into an optometric office because the parents were made aware of the importance of vision and the importance of complete visual care. She was given a visual examination available only in optometric office where comprehensive visual care is based on the philosophies of the Optometric Extension Program. The depth of her visual problem and the etiology of her visual inadequacy were recognized because of the developmental philosophy now available only in an optometric office. The alternatives which were presented to Mrs. C. were based on the diagnosis and the prognosis possible only because of the functional concepts that exist in optometry. The visual training procedures which were recommended for Melissa are concise and pertinent because of optometric recognition of visual perceptual processes essential to visual performance and the resulting visual comfort.

The ability to diagnose every visual achievement problem will come from a broader understanding of developmental principles and their application at every age. The long-established syndromes which provide case typing out of the analytical findings have provided a tool for proper visual care for adults. Syndromes and performance profiles for the diagnosis of children's visual problems are now being devised. In next month's paper this series will introduce an Operational Scale to determine where the visual lag or deviation occurred in the developmental processes. This Scale is an extension of the Diagnostic Profiles developed by Dr. Wayne Knight, presented in the December bonus manual. It is now being refined and will be discussed in detail in this series so every optometrist who wishes to use it can determine the type of visual guidance needed for every youngster.

Mr. and Mrs. ______ ______
____________, __________

Dear Mr. and Mrs. ________:

Following Melissa's complete and very thorough optometric visual examination, a program of out-of-office visual training was mutually agreed upon as the best solution to her present visual difficulty. It is important to remind you that visual care which merely includes a pair of glasses is not to her best interests nor to her future visual welfare. After carefully considering Melissa's visual difficulties, the following procedures are being sent you. These have been thoughtfully designed to assist her in eliminating the discomfort and difficulties you described to me at the time of Melissa's examination. The best results will be obtained by Melissa if you will set a regular daily schedule for this work. Please use these procedures in the sequence given you below so that she may be assured of improvements in the least possible time.

A. Open and Closed Eye Movements

The ability to move eyes quickly and smoothly is very important to comfort in all visual activities. <u>Eyes that cannot move efficiently cannot work together as a team</u>, and fatigue and headaches will result from many visual activities regardless of how clearly a person sees. The following routine is very important to Melissa's future comfort.

1. Have Melissa stand in the middle of a room so she can see all four "edges" of the wall ahead of her. Have her hold her head perfectly still and start in the upper corner and follow the ceiling-wall line with her eyes to the opposite corner. Then have her follow the line made by the junction of the two walls from the top ceiling corner to the floor. Next, have her follow the baseboard line across the lower wall and finally the corner line up to the starting point. Frequently it helps to do this more accurately if a person pretends there is a fly crawling along these four lines. If you have a large picture window, or even a double window at the end of a room, Melissa could use the lines formed by the woodwork around the window as a guide for these eye movements. As you can see her eyes moving more smoothly, have Melissa move closer to the wall or window so that eyes make wider sweeping movements.

   As Melissa's eyes become smooth and fluid in these movements, have her stand in the same position but go through these same movements with eyes closed, <u>as if</u> she could see the lines that she is following with her eyes. When Melissa first uses this procedure, eyes may get quite tired. As fatigue lessens, increase the time spent at this routine. As you can imagine, it is much harder to keep eyes moving when the lids are closed. You must remember that Melissa will not have gained the freedom and skill of eye movements that she should have until she can do this with eyes closed as well as she can with eyes open.

B. Open and Closed Eye Fixations

Daily activities demand that a person make many quick eye movements to glance at the many things around him. If eyes do not team well, these quick glances create more fatigue because both eyes do not "land" on the object of interest at the same instant. Many people's eyes are so slow that they turn their heads instead of turning their eyes. This adds to their fatigue because eyes should move with much less use of energy than it takes to move the entire head. Melissa should practice at making these eye movements <u>without head movements</u> until both eyes can immediately "land" on any object at which she looks.

1. Have Melissa hold her two forefingers erect about 14" in front of her face with

fingers separated 12" - 14". Have her look quickly at her right forefinger, being certain that she sees it clearly and singly. Then have her make her eyes jump quickly to the left forefinger without head movement and be sure she sees it clearly and singly. Have her repeat this procedure as many round trips as possible at each practice session. As Melissa's "landings" become smoother and more accurate, have her increase the distance between fingers.

When Melissa can make these eye movements freely and correctly with eyes open, also have her do it with eyelids closed. Check her eye position by having her open her eyes when she feels they are pointing at the finger at which they should be looking. Continue this routine with lids closed until Melissa's eyes can make accurate judgments of where her fingers are held and until she has no feeling of pull nor fatigue during the routine.

C. Near to Far Focus Speed

Focusing speed will be reduced if eyes have become so slow they cannot move easily. Many patients report that when they look up from reading, they have to wait for objects across the room to become clear. This often indicates the need of a lens change but frequently it occurs because eyes have lost flexibility and efficiency. It is essential that some practice in near to far focus change be done after the above routines have been accomplished. This will assure Melissa of further comfort and the ability to make better visual judgments in all of her everyday activities.

1. Hang the front page of a newspaper on the wall. Cut out a small section of newspaper that Melissa can hold in her hands and have her stand 8' - 10' away from the full page that you have hung on the wall. Have Melissa hold the small section in normal reading position; have her pick out a word or even the letters in a word and look at it carefully. Then have her quickly shift her attention to the page on the wall and try to get a large headline, then a smaller headline and finally the smallest letters clear as quickly as possible. Have Melissa shift attention back to the print in her hand and pick out details, making every effort to see it as clearly and quickly as she can. Continue these "round trips" until the print on the wall and the print in her hands both become clear immediately.

   As Melissa makes improvements, have her move farther away from the page on the wall, and have her move the print in her hands closer to her eyes. Thus she will increase the distance between herself and the wall and decrease the distance between her eyes and the print in her hands. Work at this routine as necessary to get comfortable, immediate clarity both places.

D. Eye-Hand Judgments

Your usual day, whatever your occupation, demands skill in eye-hand co-ordination. Without giving it special thought, one does not realize how frequently hands are steered by eyes. The accuracy with which you pick up anything is predetermined by how well you visually judge the location of objects. If eye movements have been slow and inefficient, many hand activities will also be slow and inefficient. This also adds to fatigue and sometimes results in unnecessary accidents. Like all other visual skills, eye-hand co-ordination can be learned and improved. The following routine is very important to Melissa's comfort and skill in everything she does that involves using her eyes and hands in combination.

1. Put a string through a rubber ball (about two inches in diameter) so the ball can be hung from a light fixture or doorway.

   a. Have the ball at Melissa's eye level when she stands facing it. Swing it

gently to and from her and have her watch it, as it comes and goes, two to four minutes.

b. Swing it side to side and again have her watch it as it swings back and forth, two to four minutes.

c. Have Melissa practice the two routines described immediately above (a and b this section) until you can see that eyes follow the swinging ball with ease and do not "lose" the ball at any point in its swing. Start the ball swinging from side to side and have Melissa practice quickly and accurately touching the ball with her forefinger at the end of its swing. Have her use her right forefinger when the ball swings to her right side and her left forefinger when the ball swings to her left side. When she has become skillful at this, have her use her <u>right</u> forefinger to touch the ball when it swings to her <u>left</u> side. Then have her use her <u>left</u> forefinger to touch the ball as it swings to her <u>right</u> side. As Melissa becomes even more skillful, have her practice at making gentle accurate touches at various points in the swing. Melissa should become skillful enough so that the ball is not hindered nor deflected in its swing by her touching it. This will assure Melissa the accuracy of eye-hand co-ordination mentioned above.

It is important to remind you that seeing skills are learned. These out-of-office training procedures are all carefully designed to help Melissa and to assist her to see properly and comfortably. She must always be consciously aware that <u>she</u> is doing the learning. A visual problem is <u>not</u> a disease, thus a visual problem cannot be "<u>cured</u>" by pills, drops, nor ointments. The final elimination of her visual problem is dependent on frequent, proper, regular practice. The responsibility for success is Melissa's, just as it is in any other learning program. It is my responsibility to guide her and make recommendations for her improvements, but we cannot do the learning for her. The two most important factors in Melissa's visual improvements are: (1) she must have a desire to improve; and (2) she must work at her training procedures on a definite schedule. If these two requirements are met, you can expect Melissa to achieve maximum visual comfort and ability.

Melissa's progress will be watched very carefully and these training procedures discussed with you on each of her office visits. Should you have any questions concerning the routines or reasons for the routines, please do not hesitate to contact me.

Very truly yours,

__________________________O.D.

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

"FURTHER CONSIDERATION OF THE PROFILE"

June - 1960 Series 4 No. 9

The Developmental Profile for determining visual performance levels, which was designed by Dr. Wayne Knight, has become a very useful tool. Many optometrists around the nation are reporting its value in case appraisal. Several have reported removing it from the Manual (distributed by OEP last December) and having it on the desk for reference immediately following an examination and before completing the conference with parents. The Profile has also been discussed at length in several seminars, and its value increases as it becomes more widely used in analysis of the visual performance levels seen during the test sequences.

Discussion and explanation of the Profile in recent seminars have indicated some minor changes in terminology. There are also some additions which can now be made that make it easier to use in understanding the visual behavior observed. Organismic motor patterns have been analyzed in relation to the Profile, and they take on new meaning in the understanding of movement as a foundation for vision. All of these extensions in the concepts of operational vision now permit the development of an operational vision scale, and this will provide a device out of which syndromes can be built. It is important to state that the original Profile is as valid as ever. The changes that are being made, and which will be discussed in this paper, merely clarify it to make it more useful.

It is now recommended that these additions and extensions be printed as follows:

In Boxes 1, 2, 3, and 4 (the extreme left column of the first section) please add these words: Box 1--Segmented; Box 2--Unorganized; Box 3--Immature; and Box 4--Integrated.

These are terms which are most appropriate to describe the four levels of total behavior related to visual development. Segmented behavior would be demonstrated by the patient (usually an extreme retardate), who cannot combine actions or abilities to accomplish a task. The youngster who shuffles and stumbles as he walks, showing no visual awareness of obstacles in his path, would be moving as though his legs were not a part of him. The child who works at the Form Boards on a trial-and-error basis with no visual inspection of size or shape would demonstrate a behavior which would appear as though hands were getting no information from eyes. The child whose speech is totally unrelated to the task at hand would be operating as though his conversation was separate from his visual inspection of the test materials before him. These types of behavior would be described as segmented performances.

Unorganized performance is a bit more difficult to describe and is also a bit difficult to observe. It is the type of performance that is definitely more adequate than segmented behavior, but is neither as adequate nor as productive as immature behavior on test materials. It would be illustrated by the child who moves around without too much clumsiness, but has no sense of orientation in his movements. This patient would probably complete Form Boards on a trial and error basis, but placements would show no visual discrimination of the details by which immediate and effective judgments of size and shape could be accomplished. Speech, which should relate to the visual test situation, would be limited and erratic. This child might be able to say, "square," "circle," or "triangle," in describing Form Board pieces, but he would not be able to name each piece correctly.

Immature behavior would be best observed in the child who performs quite adequately on all tests that are concrete and demand the least visualization. This child moves about freely and can find his way from one room to another if it is familiar territory. His general motor control would appear to be quite excellent until he faces the task of a walking beam or a balance board. He would be able to complete the solid forms of the Three and Six-Figure Form Boards on visual inspection, but would have to revert to trial and error or even to piece-by-piece placement on Split Form Boards. He would be quite successful in placing the distinctly different pieces in the Circus Form Board but would have considerable difficulty on the pieces that are similar or have minute differences in shape or size. In conversation relative to the tests his speech would reveal the immaturities of his concepts of the tasks at hand. He might be able to name the various pieces but would not be able to relate them to his experiences outside the test circumstances. His Spontaneous Drawing would be limited or would be considerably simpler than you would expect from other observations made in other tests. His performance on Tactual Forms might be surprisingly poor but would be typical of his inability to move into visualization of simple abstractions.

Integrated behavior would be almost self explanatory. This would be seen in the youngster who does well in all tests of visual development. He can shift from one ability to another and from one information receptor to another, or he can translate information into action without losing contact with the task at hand. This would be the child who moves about the office with ease and with complete orientation. He would complete the Form Boards on a visual inspection level, and his conversation about the tests would be highly descriptive and related to his visual activities during the test.

These four levels of visual development are difficult to generalize, but you will find that as you observe children in their activities, you will be able to identify each level. The men who are now familiar with these descriptive terms because of the seminars, are finding them useful in determining where to start the training and guidance program.

There are several other changes which should be made in the first section of the Profile. Column D was titled 'Ocular Dynamics.' This should be changed to read "Ocular Motor Patterns." Each of the levels described in this column is investigated primarily with the Dangled Bell. Since the primary investigation is being made in ocular fixation, release, and pursuits, the new title, "Ocular Motor Patterns," is more descriptive and more appropriate.

Column E was titled "Visual Consistency." This should be changed to read "Visual Circuit Consistency." Box #1 at the bottom of Column E contains the word, monocular. Please cross this out and insert "single circuit." Box #2 contains the word, bi-ocular. Please cross this out and insert "two circuits." In Box #3 cross out the words, binocular-bi-ocular, and insert "reciprocating circuits." In Box #4 cross out the word, binocular, and replace it with the words, "redintegrative circuiting."

Discussions with several men have indicated that these new terms are more appropriate to the ocular behavior observed in the tests related to this aspect of operational vision. These terms are also more descriptive of the responses which can be observed with the retinoscope, the vertical prism, and the red glass. These levels, as observed by the retinoscope, were described in detail in the Developmental Vision paper of April, 1958. In that paper what is now being called the single circuit level, was described as a random limited brightening of the retinoscopic reflex without pattern and was compared to an amblyopic eye. At this level, according to the Profile, only one reflex would be bright, and the other would be consistently dull. What is now being called the two circuit level was described as Stage 2, as an alternate brightening and dulling of the retinoscopic reflex. It was called the right or left stage and has been discussed at congresses as the "one or other" stage. The level now referred to as the reciprocating circuit level was described as Stage 3 in the April, 1958 paper. Here there is an overlapping, or intermittent bilateral, brightening of the retinoscopic reflex. This has been described as the right-and-left stage.

The redintegrative circuiting level of the Profile is described as Stage 4 in the earlier paper. This stage is the level where monocularity and bi-ocularity have been completed in the visceral mechanism of the eyes as the foundation for accommodative binocularity. Here the teaming of eyes can be observed with the retinoscope just as teaming can be observed on the dangled bell. This stage or level was described as the rightleft stage.

These changes in the Profile have been made for another reason. The terms, which were used when the Profile was first published, described what was happening in the receptors and did not fully describe the entire visual complex. Furthermore, in order to think of operational vision as it includes the total organism, it is necessary for the philosophy to explain the type of behavior which is demonstrated by the person who has lost an eye because of pathology or accident. Every optometrist has found the one-eyed patient whom he must treat and care for as if he had two eyes. These are the patients, who in spite of sightlessness in one eye, hold their reading or all near-point work on mid-line. These are the patients who probably are utilizing redintegrative processes to maintain both visual circuits even though one receptor is not functioning, or is only operating at minimal function or receptivity.

There are three other processes of visual development not specifically mentioned in the Profile which need to be discussed in this paper. The first of these is body scheme.

The Manual in discussing the Incomplete Man Test (page 36) states, "This test probes the child's awareness of body parts and their purposes." It also states, "The test probes the adequacy of his own body scheme." A child's concept of his body parts and their purposes emerges from all movements and from his organization of the two architectural halves of his body. His awareness of his body scheme can be observed in many ways, and his concepts of directionality, his knowledge of right and left, and his ability to make direct effective movements through space, are all derivatives of his body scheme. If optometrists are to fully understand the levels of achievement essential for classroom success, the role of body scheme must be clearly understood. This series on "Operational Vision" will refer to this perceptual emergent in following papers.

The two other processes which need our consideration relate to speech and its role in visual development. There is no intent to discuss speech problems or speech defects. It is necessary that consideration be given to speech as a method of communicating information that the patient obtained through visual mechanisms. The two types of speech which optometrists should be aware of are: a) auditioned or imitative speech, and b) descriptive or original speech. Auditioned speech is that used by the child when he parrots what he has heard without apparent discrimination or interpretation. The very young child does a lot of this in learning to use his voice for communicative purposes. Descriptive, or original speech is the use of words to describe in the child's own language what he is seeing or doing.

This paper has discussed certain changes and additions to the Profile for a very definite reason. All optometrists who have been working with children have felt the need of syndromes which could be utilized on the developmental series of tests just as syndromes can be used in standard Analytical sequences. There have been several difficulties in attempting to build such syndromes. First of all, children's visual behavior cannot easily be reduced to numerical measurements. It can only be recorded through observations and descriptions of their performance. Second, the organization and application of training programs must follow the over-all sequence of development in all children, and a specific recipe for a specific attack upon a specific problem is not possible. The philosophy of organismic totality negates the possibility of a specific problem. Every problem bleeds into every developmental process and is reflected by inadequacies in every related function. It is a well-known fact that myopia cannot be eliminated by accommodative rock training; high exophorias cannot be eliminated by prism base-out training, etc. An operational vision scale has been designed that will let optometrists analyze each case in keeping with developmental growth and experience related to the processes of visual development. This scale will be discussed in next month's paper.

OPTOMETRIC EXTENSION PROGRAM · 1928 ·

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

"AN OPERATIONAL VISION SCALE"

July - 1960 Series 4 No. 10

In last month's paper mention was made of a scale by which optometrists could determine the levels of achievement in each of the processes of visual development. The scale, as it is now designed, was prepared for staff use at the Summer Achievement School, which will be held in August, 1960, in Wisconsin. The children who are enrolled in this program have all received a complete examination of visual processes according to the tests described in the manual, "Techniques and Diagnostic Criteria for the Optometric Care of Children's Vision." These examinations resulted in an extensive file of information on each child. These files could not be sent in their entirety to each of the staff, but it was important that each member of the staff had a working knowledge of each child before the Achievement School opens. Thus, it was essential that some kind of summary of their individual abilities be prepared. The scale which accompanies this paper has been used for this summary, and each youngster was "pictured" on the scale according to his test results.

It is most interesting that the Achievement School staff has already reported that they can visualize each of the children enrolled because of this scale. The individual staff members have also reported that they are able to lay out a program of training and guidance for each child according to this scale.

The scale design received a very critical test when several sheets were presented to Dr. Ray Barsch of Milwaukee, who is co-director of the Summer Achievement School. Six of the children were scaled, but their names were omitted from each sheet. These were then presented to Dr. Barsch to see if he could identify each of the children. This he could immediately do, and we concluded that such a device would be adequate for our purposes.

This scale has been presented at several seminars. This type of dissection and discussion indicates that the scale can be useful in determining present developmental levels, the etiology of the problem, and the prognosis on the case. This may seem a bit optimistic, but use of the scale in standard office practice is at least beginning to substantiate its value.

Inspection of the scale, as it is now laid out, will show that it follows the processes of visual development that this series of papers has been discussing for almost four years. Further it follows the manual mentioned previously with the exception of the new items discussed in last month's paper. Each of the levels, reading from the bottom of the column upward, represents the organization of the total organism toward the emergent we call vision. Each of these levels has been described in the Profile, but a brief review of the tests and the observations by which their adequacy can be judged is in order.

Gross motor patterns are judged and observed as the patient walks into the examining situation. As optometrists learn to appraise body posturing and body movements, they will be able to plot the adequacy of these motor patterns in one of the four vertical columns.

Reciprocity of organismic halves can be observed in total movement but also in use of hands to support each other, teaming of eyes, and if desired, performance on walking beams and balance boards.

Body scheme can be appraised in body movements in completion of the Incomplete Man, and if desired, in the tests of dominancy,

used by many optometrists. (One of the staff members in the Wisconsin Achievement School is preparing a series of tests for body scheme, and this will be presented later in this series.)

Fine motor patterns can be observed in almost every test used on children or adults. It is most observable on Form Boards, Key Forms, and pencil and paper tests.

Eye-hand relationships are also observable on Form Boards and pencil and paper tests. These are most clearly observed on the Dangled Bell Test when the child is requested to bring a hand into the activity.

Ocular motor patterns are most clearly observed on Dangled Bell and Vertical Prism Tests. These can be further observed in any test of ocular pursuit, either during an examination or in the training room. These motor patterns are familiar to everyone and are the ocular abilities which have received so much attention in all basic visual training.

Visual circuit consistency is observed with the retinoscope and is determined by the brightness and the stability of the retinoscope reflex and by comparing one eye with the other for a judgment of both circuits.

These first seven processes are bracketed on the Scale to indicate that they are basic patterns essential to the motor adequacies of the receptors for vision. These seven are indicative of the ocular machinery's freedom to move or freedom to act in the total process of receiving information from light patterns on retina. These are the operational processes which must be achieved before the visual complex can act for interpretation. The signals that leave the retina to be received and interpreted in the higher centers of the central nervous system are determined by the adequacy of these motor processes. Furthermore, these are the processes which provide sight and can be observed and measured to some degree in every animal that depends on a sight mechanism. Although these are extremely essential to vision, these processes alone only provide a consistency of input, and vision as we know it comes after these basic processes are established. The classical concepts of sight all stop at this point, and thus, the mechanistic or nonoptometric concepts do not allow for the development of vision as the dominant process in human behavior.

The second bracket, which includes the next seven processes, completes the scale device for the study of visual organization and ultimate operational vision.

Visual form is observed in a number of test situations but is most obvious on the Form Boards, the Geometric Forms, Spontaneous Drawing, and even the Snellen Chart.

Visual size discrimination is observed most easily on the Sized Blocks. The careful observer will note the patient's ability to make size judgments in many other ways and will get important information from Form Boards, Puzzles, Spontaneous Drawing, Geometric Forms, and Tactual Forms.

Visual space discrimination is most apparent on the Key Form Boards. This test provides almost immediate indicators of the patient's concepts of directionality. When a youngster is questioned about his Spontaneous Drawing or his attempts to incorporate tridimensionality into a drawing, further information concerning visual space discriminations becomes available to the examiner. The SILO findings in the standard analytical routine of test provide information regarding the patient's ability to interpret visual space and visual size.

Auditioned speech and descriptive speech provide the examiner with the opportunity to determine what information the patient received through his visual mechanism. These opportunities are present in every test given to a patient. This series of papers has frequently emphasized the importance of watching what the patient is doing, and in some instances these papers have stated, "Pay more attention to what he does than to what he says." Now that we are able to make better observations of visual behavior and performance, it is time to incorporate our observations of speech as it relates to the entire sequence of visual development.

Emphasis has been put on Spontaneous Drawing as a pertinent indicator of child's ability to visualize. This test still is the most significant test method we have, but as we become more familiar with the total organization of vision, we will find

that we can observe concept visualization in many situations. A child's ability to tell you about classroom activities, and the continuity of his story in the telling, will provide additional information concerning this process.

The comprehension level that a patient has achieved is most quickly determined by the book retinoscope technique. Many optometrists are using some of the standard reading tests, and these also provide this information if the tests are fully understood by the examiner.

These tests indicate the patient's freedom to abstract and synthesize the information received from the ocular input. Implied in these tests are all of the functions that we in optometry recognize as contributors to vision. It should be stated that each of the processes listed on the Scale is an emergent of the preceeding process. If one will start at the bottom of the column and consider each performance area, he will see how they lead into each other. Further, the processes indicate the sequence of development. Thus, at the top of the column we find the words, emergent vision.

A brief comment should be made about the four columns to the right of the list of functions. Each of these is divided into three sections in an attempt to denote progress toward more adequate performance. We know very well that no behavior can be described by precise specific sectioning. Thus, the scale is set up in such a fashion that the observer can indicate the degree of achievement through time toward the ultimate integrated levels.

As each response to the test situations is analyzed, the levels of adequacy can be plotted on the Scale somewhere in the four vertical columns. The normal trend of development would allow a child to achieve integrated abilities in gross motor patterns first. As the child goes through time, and because of experience and guidance gains more and more skill in each process, the scale will show his acquisitions extending toward integration in basic functions first. The scattergram would indicate a slope from upper left-hand corner to lower right-hand corner (see sample #1). This slope would indicate the expected trend of a normal child toward the acquisition of the ultimate in operational vision.

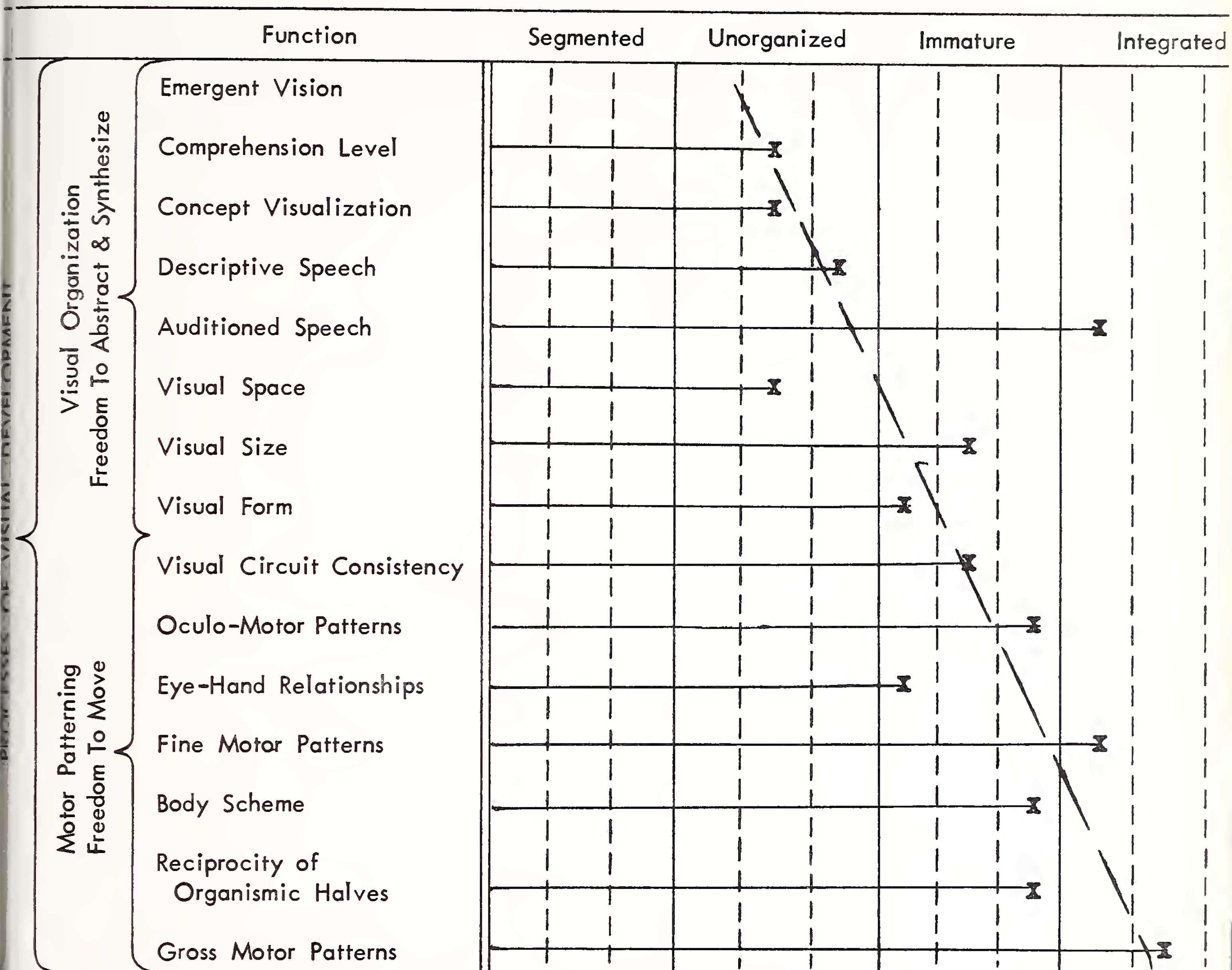
The human being is capable of acquiring cultural skills by substitution. Many slow-learning children, and especially those who are classified as retardates, will appear to be quite adept in activities that can be related to the upper half of the Scale. For example, through sheer practice and special training they can do well on jigsaw puzzles; they can make passable judgment of size and distance; their speech can sound quite adequate; and they can draw a simple picture in a Spontaneous Drawing Test situation. If this type of youngster is plotted on the Scale. the scattergram could slope from upper right to lower left (see sample #2). In our present use of this Scale we would consider this to be a deviate pattern because careful analysis of the behaviors would show no foundations in motor system, which is so essential to intellectual behavior. This is the child who will break down under the stress of demands that are greater than his capabilities.

The two samples used in this paper are taken from actual case records. They are included here for illustration only and to present this Scale as a method of approaching a syndrome which can be utilized in the analysis of the basic test sequences. The next paper in this series will present a full case history, and examination results for further illustration of how this Scale can be used.

SAMPLE #1

OPERATIONAL VISION SCALE

Name: Steve W. Age: 5 8 Date: 3-16-60

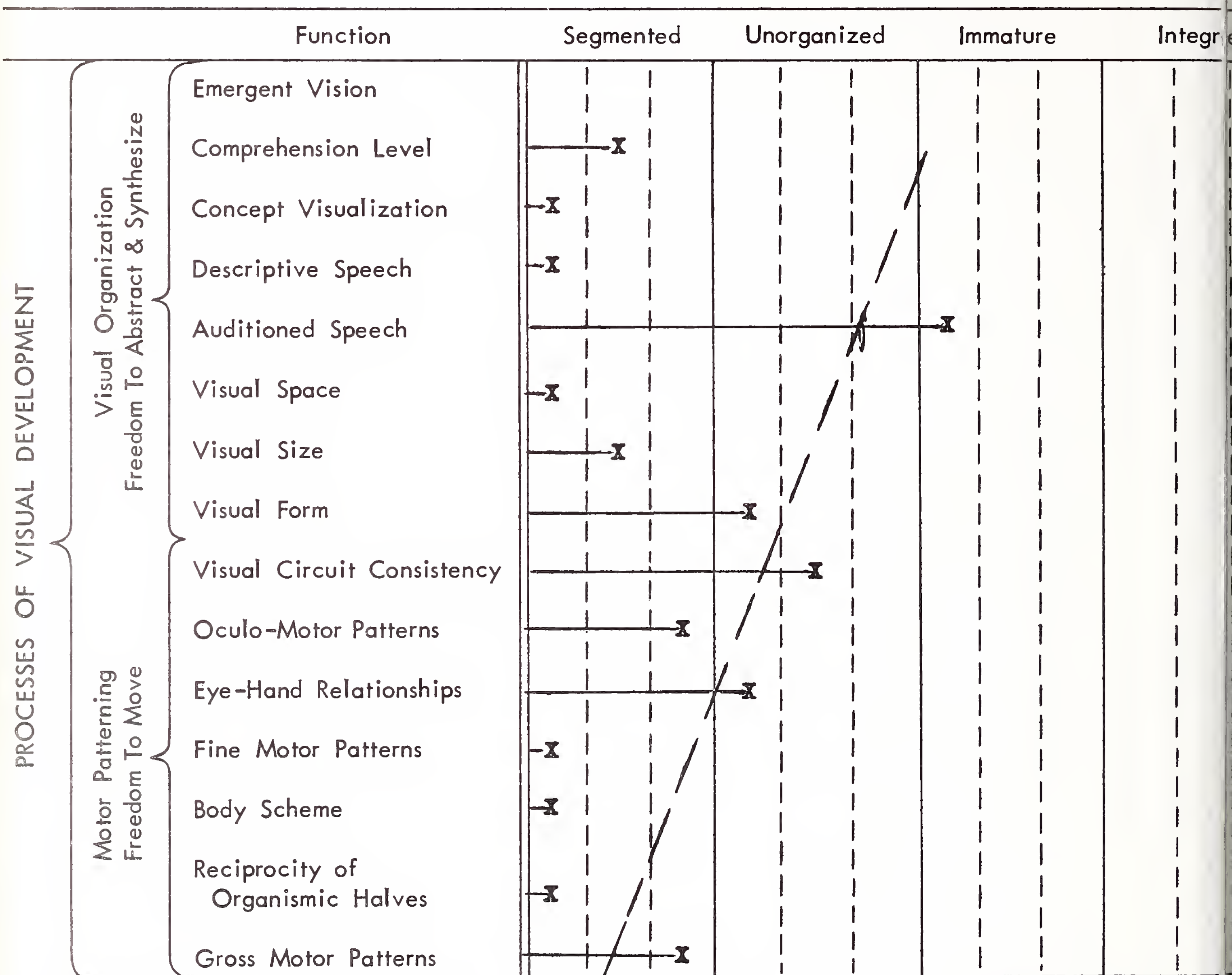


Summary: Steve is progressing very well in standard kindergarten activities. Has had excellent guidance by parents and is developing many readiness skills through experience with proper toys, coloring, cutting and pasting, puzzles, and blockraft. He will continue to profit by optometric and parental guidance because his skills are a bit less adequate than his achievement desires. He will need lenses for school in first grade, and he can become a superior child. He falls into the "immature" column on the scale because his self-imposed goals are somewhat beyond his skills. Visual training and lenses will assist him to acquire the skills he needs. His visual training will continue to include chalkboard for directionality and motor activities, which will increase his concepts of visual space.

SAMPLE #2

OPERATIONAL VISION SCALE

Name: Donnie B. Age: 12 Date: 1-4-60



Summary: Donnie shows extreme motor disabilities for a 12-year-old boy and has not developed the motor patterns essential to the development of vision. He is learning to depend upon hands instead of eyes for information and frequently appears to comprehend because of his ability to repeat words. Any visual stress reveals the lack of motor foundations, and ocular motor control disappears. He needs much training emphasis in all basic motor processes before basic visual training is instituted. Lenses will not be of significant assistance to him until <u>all</u> motor processes are improved. He has not acquired these motor skills in early childhood and will not progress in any academic area until he has achieved underlying and essential visual motor patterns.

VOLUME 32 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

CASE APPLICATION OF THE OPERATIONAL SCALE

August - 1960 Series 4 No. 11

In last month's paper the Operational Vision Scale was presented as a means of case analysis and case programming. Previous papers have implied that there were occasions where the standard Analytical routine needed to be supplemented with further tests in order to expose the entire visual problem. This certainly casts no reflections upon the validity and usefulness of the Analytical Examination. The youngster who is failing in school, and especially failing in reading, will frequently have a more extensive visual problem than the Analytical will uncover. This is especially true in those occasions where the Analytical provides a set of findings which are not significantly deviant from the expecteds. It is also true when the Analytical findings show a rejection of plus, or when the case history indicates that the school achievement problem is so great that lenses alone cannot be expected to provide a solution. Answers must then be sought beyond the standard examination routine.

It is important to remember that the Analytical sequence tells what has already happened to the patient's visual processes. The more familiar one becomes with the standard examination procedures, the better he will understand where and how the problem originated. There are cases, however, where concern with school achievement must be greater than the concern over immediate acceptance or rejection of plus lenses. There have been too many cases where lenses alone have not solved the problem, and the optometrist has been blamed for prescribing unneeded glasses, or has been condemned for doing something that did not help the child in school.

David, age 10, is one of these youngsters whose achievement problem is much greater than the Analytical Examination would indicate. David is in fourth grade, and his mother reports that his primary problem is failure in reading. The Parent Interview Form states, "He seems to see words equally well upside down. He occasionally makes his letters backwards and reads some words backwards. On occasion he holds his book too close to his eyes. He has never complained about his eyes, but he does have headaches rather frequently." The mother reports no obvious symptoms of ocular discomfort.

David is in excellent physical condition. He likes school, his teachers, and his classmates. He has not repeated any grades, but reading has been difficult for him from the start, and he spent the summer between third and fourth grade in remedial reading classes. His developmental history was negative with the exception of poor speech until the age of three. There were the usual preschool illnesses, but none of them was severe.

David had frequent visual examinations, "because we have had some eye defects in my family. We had David's eyes checked before kindergarten, and again before third grade. Following each examination the optometrist reported, 'His eyes are good, and there is no need for glasses.'" The mother gave this brief summary:

"He said a dozen words plainly at age one year and then started pointing. When he did speak, he was unhappy because we could not understand him. He has a naturally happy disposition and now has a good speaking vocabulary. He seems to have lots of friends. He likes games and is a good swimmer. He reads pictures and likes to have someone read to him. His teacher refers to his reading trouble as an emotional block.

"He has had some readjustments as a child. First, his father became ill and passed

away when David was less than two years of age. Two years later his grandmother, with whom he was closely associated, passed away. In 1957 I had some very serious surgery and was very ill for a number of months. I am not convinced that this is really the entire trouble as he was not learning to read in first grade, a year before I was ill. David went to a remedial reading class this past summer, and I think he was helped, but he reads slowly and is not at the 3.2 grade level. These texts in fourth grade have a vocabulary which is much too hard for him."

Conversation with David was very enlightening to the examiner. He reported that he liked arithmetic best of all. He guessed reading was his hardest subject. He felt that his easiest subjects were art and spelling. He liked workbooks, but sometimes they were hard. Upon specific questioning he stated that he would use his finger to point and follow the lines in reading if allowed to do so. He stated that he could always keep his place better if he used his finger.

He reported no blurriness at reading, and that he could always see the blackboard clearly. He stated that there was always a little blur if he looked up quickly from his desk work. He never was aware that one eye would get tired first, nor could he report any ocular discomfort from near-point activities. He felt that his headaches came from hard play. His comment, "My hand gets more tired than my eyes do," was of particular interest.

His visual abilities were all very adequate. There was no significant deviation from any of the expecteds. His acuities near and far were 20/20 or better.

Before the Analytical findings were taken, ocular fixations or pursuits were explored with the Dangled Bell. He could hold fixation to about six inches but could not maintain binocular fixation for any length of time. The release was very jerky, and he could not recover fixation unless the bell was moved out to 14 inches. Use of hands to locate the bell did not assist refixation. Pursuits showed some jerkiness in all meridians with left eye losing fixation frequently. As the bell test was continued, both eyes became slower, and fixation became more difficult.

Because of David's difficulties on the Dangled Bell Tests he was asked if he ever saw two words when he knew there was only one on the work sheet. He replied that this happened once in awhile, but he did not think it was unusual because some of the other youngsters in his remedial reading class reported the same thing.

His Analytical findings were as follows:

#3	Ortho.
#13A (14 inches)	4 exo.
#4	O.D. +.50
	O.S. +.75 (O.S. reflex unstable)
#5	+2.00 O.U. (Reflex more stable each eye but still variable)
#7	+.25 O.U. 20/25
	Plano O.U. 20/20+
#8	1/2 exo.
#9	6
#10	14/4
#11	4/0
#13B	5 exo.
#14A	O.D. +1.50 (Spontaneous hand movements preceded each verbal descrip-
	O.S. +1.75 tion or decision)
#15A	10 exo.
#14B	+1.00 O.U.
#15B	8 exo.
	(All near-point findings through +.75)
#16A	6
#16B	18/-2 I.
#17A	16
#17B	24/22 S.I.

#19	5.00+	(questionable)
#20	-4.00	(answers slow and
#21	+1.50	uncertain)

David was moved from the refracting instrument to the 10-20 desk, and the advanced sequence of Visual Development Tests was presented to him. Visual Forms were done with some difficulty (see fig. 1). He made several comments that his lines were not correct. He asked permission to redo the square because "The sides are not as long as other lines." He could not draw a diagonal line and rotated his paper so all diagonals were made with vertical movements. All drawings was done with his right hand, and the left hand was used to rotate the paper.

The 6-Figure Form Board was completed with ease, and all forms were placed with the left hand. When the Split Forms were presented to him, he combined a few pieces before placing them into position. The oval, the circle, and the square were immediately combined. He reverted to trial and error in placing the ellipse and crescent and had extreme difficulty in completing the cross.

He used both hands with equal dexterity on the Key Forms but preferred to use the right hand.

He chose his Sized Blocks on a visual basis but did some tactual comparing on the 5's and 4's. He completed the stairway very quickly and adequately. He had difficulty, however, in making combinations of two blocks to equal the height of one. Again he reverted to trial and error.

Upon questioning David did not know which was his right hand and which was his left hand. He could not identify correctly the examiner's right or left hand.

The Operational Vision Scale* for David indicates that the basic processes for adequate visual performance had not been acquired (see fig. 2). This Scale illustrates the fact that David did not have the underlying motor patterns that would assure him of the visual organization for successful classroom achievement.

Because this Operational Vision Scale is a new device, it is appropriate to discuss the analysis made of David's performance and how his syndrome was determined.

In spite of his mother's comment that he liked games and was good at swimming, his clumsiness and his general lack of coordination were very apparent. At times, under special demands such as a walking board, he could maintain some organization of motor patterns. When he was in conversation with the examiner (as he walked from reception room to examining room), he stumbled on the sides of the doorway. As a result, he was scored as ranging from Unorganized to Inadequate in gross motor patterns. He could make combinations of motor patterns when he had to, but could not maintain anything resembling wholeness unless he concentrated upon it.

David demonstrated repeated confusion in any task demanding a reciprocity of halves or an awareness of body scheme. His ocular pursuits, his pencil and paper work, and his difficulty in identifying right or

*In an effort to make the Operational Vision Scale meaningful and useful, some of the terminology needs clarification. Note that Column 1 and Column 3 have been retitled. Although further use of this Scale may indicate additional change in terminology, the following definitions apply as of now:

Unrelated: No link or association between naturally related parts or performances.

Unorganized: Not yet formed into a systematized wholeness.

Inadequage: Not equal to requirements; in the right direction but insufficient for final solution.

Integrated: Made up and completed as an interrelated whole -- a totality.

left hand all demonstrated his problems in these areas of motor patterning. At times he could use one hand in support of the other, and so he was given the benefit of a doubt in his scoring on body scheme.

Inspection of his Visual Forms (fig. 1), could be very misleading without the description of his method of completing these forms. His difficulty with diagonal lines, which were usually drawn with vertical movements, lowered his score in fine motor patterning. On the other hand, his dexterity on the Key Forms raised his score in this area. Thus, he has been scored across the entire column on the Scale.

The Dangled Bell Test and the observation of hand movements during the Analytical Examination indicated that eye-hand relationships had not been established by David. He received no reinforcement to ocular fixation when he touched the bell. His comment, "My hand gets more tired than my eyes do," also verified this lack in eye-hand relationships. Here then, he was scored in the first column on the Scale.

All ocular motor patterns on the Bell, his reports of diplopia, and his difficulty on the near-point ductions indicated a rather low scoring on the Scale.

Although there was no doubt about neutrality in retinoscopic findings, the instability of the reflex and his difficulty on #14A and on #20 and #21 showed a lack of consistency in visual circuiting. Because a neutrality could be ascertained, David was scored in the Unorganized Column. The greatest spread of performance occurred in Visual Form. If the Form Board was simple enough, he could complete it on a visual basis. When the more complex form boards were presented, he reverted to trial and error, indicating a lack of organization in any visual form demanding an awareness of relationships. In this area of visual behavior he showed the most obvious inadequacy and the greatest problem which he faced in classroom achievement. The extent of the difficulty with complex form, so obvious in his performance on Split Form Boards, was a major clue in this case and will be referred to later in this discussion.

His performance on Sized Blocks was also variable. When size was the only visual decision he had to make, he could complete the task with some success. However, he had to revert to tactual clues in several instances, and thus he was scored as not yet having gained full organization of size relationships.

When he had to combine blocks for equal heights, he had extreme difficulty and became quite frustrated. His performance here was so much trial and error that he had to be scored low in Visual Space.

David's vocabulary and his general use of speech could also be misleading. He used words which were not always correct nor appropriate, and he could immediately be scored as having speech facilities beyond his comprehension. His imitative speech (Auditioned Speech) exceeded his other areas of performance, and as a result, he was scored as best in this area.

His descriptive speech showed his lack of comprehension, but because he had practiced four years at talking his way through school, this performance area was more adequately developed than were other skills.

Although the Spontaneous Drawing Test was not utilized, his mother's comment during the conference that he did not like art in any form--at school or out of school--indicated his difficulty in visualization. As a result, he had to be scored as being Unorganized in this ability.

His comprehension level was also low and Unorganized. His inability to read simple material with comprehension, and his observable difficulty in almost every test situation placed him in the Unorganized column on the Scale.

David's is not an unusual case. This picture is typical of almost every youngster, seen by optometrists, who is failing in the requirements of the standard reading program. Because so many of his performance areas fell in the left-hand half of the Scale, he could not be considered as having anything more than an Unorganized visual level. As stated previously, his greatest difficulties lay in the basic motor patterning, which of necessity must

be established before visual performance could emerge. His Analytical findings showed very little plus acceptable and so much confusion and instability during the examination that it would be difficult to expect that a pair of lenses could make any significant change in classroom performance.

The summary, as a result of David's syndrome, was as follows:

"A pair of glasses will not solve the problem now. Neither can this problem be solved by further emphasis on 'remedial' reading. Although David will profit greatly from a lens prescription later, his needs now are:

1. Selected gross motor activities to establish basic motor patterns.

2. Specific visual training routines to gain eye-hand relationships, improvement of all eye movements, and a stability in visual circuiting that will allow him to use eyes as receptors for information and knowledge."

In next month's paper the program of visual care will be described, and David's progress reports will be summarized.

David W.

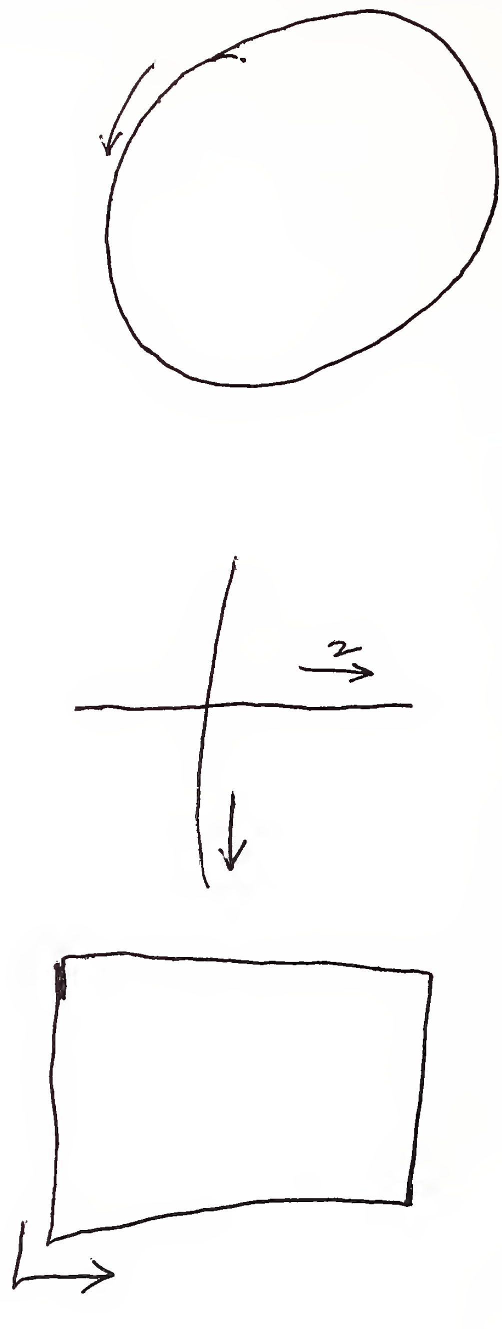


FIG. 1. Visual Forms

David W.

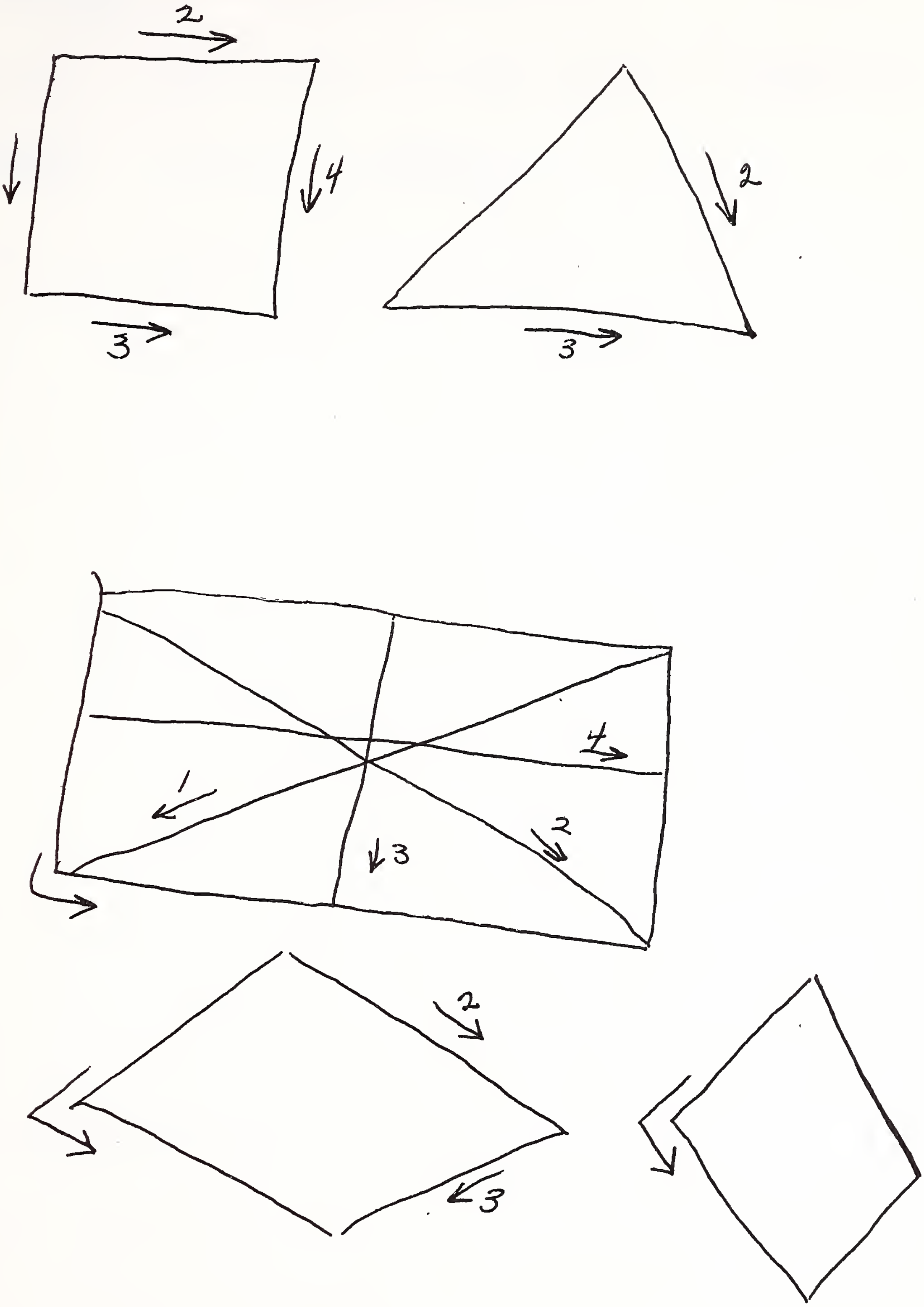


FIG. 1. (Continued)

OPERATIONAL VISION SCALE

Name: David W. Age: 10 Date: ____________

PROCESSES OF VISUAL DEVELOPMENT

Process	Function	Unrelated ~~Segmented~~	Unorganized	Inadequate ~~Immature~~	Integr
Visual Organization Freedom To Abstract & Synthesize	Emergent Vision		X		
	Comprehension Level		X		
	Concept Visualization		X		
	Descriptive Speech		X		
	Auditioned Speech			X	
	Visual Space	X			
	Visual Size		X		
	Visual Form		X —	X	
Motor Patterning Freedom To Move	Visual Circuit Consistency		X		
	Oculo-Motor Patterns		X		
	Eye-Hand Relationships	X			
	Fine Motor Patterns		X — X		
	Body Scheme	X —	X		
	Reciprocity of Organismic Halves	X			
	Gross Motor Patterns		X —	X	

Summary:

FIG. 2. Operational Vision Scale

VOLUME 32 — OPTOMETRIC EXTENSION PROGRAM PAPERS — (POSTGRADUATE)

OPERATIONAL VISION

A series based on optometric procedures of G. N. Getman, O.D., presenting the functional approach in the testing, guiding, understanding, developing of vision in child and youth for meeting the demands of the culture.

CASE APPLICATION OF THE OPERATIONAL SCALE (Part II)

September - 1960 Series 4 No. 12

David's mother stated during the conference that the appointment had been made because she knew David needed more than an eye examination. Her comments were so phrased that there was no need to present all possible alternatives. There were some considerations necessary, however, because she does not have an automobile and has a full-time job, which would prevent frequent office visits. There was also the factor of distance between David's home town and the optometric office. Two alternatives were laid out to emphasize the difference between the type of visual care that was available to David and the guidance that could be given him under the above circumstances. The full visual care story was presented so David and his mother would understand the alternatives and his responsibilities for the out-of-office visual training.

Out-of-office training routines were discussed and explained to David, and in each instance the selected routine was related to a particular problem. He was shown that his lack of ocular motility affected his ability to keep his place in reading. He was shown that his lack of fixation ability was responsible for his occasional diplopia. He was asked to estimate the distance between himself and the end of the examining room. He thought it might be ten steps, and he was then requested to walk it off and count his steps. He found that he had missed it by about four steps, and this lack of distance judgment was related to his difficulty in hitting a baseball. Every effort was made to convey to David the importance of vision in all of his activities, as well as his specific school subjects. The brief but important conversation between the optometrist and David established the goals that were important to this boy. Furthermore, it gave David ways of judging his own achievement in his out-of-office training routines and in the visual demands of playground activities.

David and his mother were dismissed and were told that they would receive a summary report and full instructions in the mail. The following is a copy of the report sent to David's mother:

"Dear Mrs. W.:
David's examination notes have now been transcribed. I have had a chance to study the records and can now give you a summary report of his visual problems and a brief review of our conference on Tuesday.

"David's eyes are in normal health with no complications due to any pathology. His major problem is related to a lack of visual skill and inadequate visual development. Although he measures a very normal amount of farsightedness, lenses are not indicated at this time but will undoubtedly be of real help to him later. We must assist him to gain better control of eyes and more adequate visual perceptual skills before lenses will be fully useful to him. This may happen very rapidly, and I might recommend lenses for school wear on his next visit. This will depend upon his progress and diligence in the recommended routines, which will be discussed later.

"I enjoyed working with David because, like many youngsters, he is 'much smarter than the schoolwork indicates.' So many parents comment about their child's difficulty in reading when the child is basically intelligent in every other activity. David showed a typical pattern of liking arithmetic best and finding spelling easiest. This is quite characteristic of the youngster who is better with his hands than he is in visual discriminations. I have often told parents that these children would get along better in school if they could learn to read by hand. Reading is a visual task and de-

mands the visual discrimination of likes and differences. This discrimination can only come out of experience and activities that allow a child to interpret what he sees regardless of what eyes measure. David's difficulty in these judgments were observed in several tests, which were called to your attention. Underlying this difficulty is David's inability to control his eye movements and to keep his eyes teaming as a pair.

"There are four areas in which David needs very specific assistance. Three of these are described in detail in the enclosed booklet.* The fourth one is the 'baseball routine,' which we demonstrated here in the training room. Specifically, he needs practice in the activities that will allow him to develop the control of eye movements. Next, he must have chalkboard activities, which will permit him to further develop eye-hand skills.

"Please read the enclosed booklet from cover to cover and then return to specific activities, which I have checked with a red pencil. Reading the booklet carefully will give you a better understanding of his problem than I can give you in a report. It will also assist you to understand the reasons behind the recommendations I have made for David. This will allow you to use a bit of imagination in varying the routines so they do not become monotonous. I wish to again emphasize the importance of daily practice periods. David's progress will be determined by the time and effort he puts into these training sessions.

"I will look forward to seeing David again in about six weeks. Thus, we can both be sure of his progress and his improvements. I will anticipate some observable gains in his reading abilities and the ease with which he accomplishes his schoolwork in general. Your observations will be most important.

"You will be notified of David's next appointment several days in advance.

Very truly yours,"

The booklet mentioned above was carefully checked with red pencil as it applied to David. Marginal notes were made emphasizing the importance of the general motor activities, such as "Angels in the Snow," the Kraus-Weber routines, walking boards, and the obstacle course. The procedures had been referred to in the conference, and the marginal notes in the booklet referred to the importance of general motor coordination.

Every activity relating to ocular motilities, chalkboard routines, and visualization procedures was also checked for David. The most emphasis was placed on general motor and ocular motor procedures.

David was seen again for his first progress report eight weeks later. About ten days before his progress report appointment his mother reported that she had also utilized the Experience Reader** routine that she had found in the booklet. The following is an excerpt from her letter:

"Your methods seem to be helping David, and we are devoting considerable daily time to the routines. He really has enjoyed the stories in his Experience Reader, and we are keeping them as a diary. When he completed the first one, he laughed and laughed to find reading like talking. I was very surprised to find that he could not do all of the exercises, and he is quite stiff and clumsy. Some he does more easily, and a few, such as touching his toes, are most difficult. I am doing them with him twice a day, and we are both improving."

David's progress report showed some very significant gains. He reported that he felt reading was better because he did not lose his place as often and was more sure of what he was reading. His teacher also reported improvement in reading. He still used his finger to keep his place after reading for a period of time, but there were fewer reversals, and his mother reported much less difficulty with b's and d's. His ocular pursuits showed improvements in all meridians, and although there was some jerkiness at the extremes, there was more teaming of eyes. His Analytical findings showed more stability and much less confusion. His near nets were still slightly in minus, but all ductions were

*The booklet referred to here is How To Develop Your Child's Intelligence.
**This was discussed in the June, 1959 paper of this series.

improved, and his responses showed more adequate discrimination.

David was dismissed for another six weeks period, and more specific out-of-office routines were discussed with his mother. The routines used at this time were presented in the May, 1960, paper in this series, and David was again indoctrinated before he left the office.

David's next progress report was even more encouraging. His mother reported that he was better at getting his homework done and was showing a spontaneous interest in the daily newspaper. She reported that he would frequently go to the WORLD BOOKS to gain information about his personal interests. David reported that his reading continued to improve, that he was making fewer mistakes in all of his schoolwork. His visual forms on this progress report were significantly indicative of his improvements in workbooks, writing, etc. (see Fig. 1). He only used his finger to keep his place when the teacher interrupted him. His Analytical findings all showed a trend toward a less complicated "B1" type with near nets of +.75. David was now given +.75 spheres for all school and homework use. When he returned ten days later for readjustment of his new prescription, he reported further increase in his comfort and ability to stay at his schoolwork through his lenses.

Neither David's teacher nor his mother was satisfied with his classroom achievement. Careful probing indicated that the teacher resented the fact that David had made improvements for which she could not take credit. There were many complications in this situation, and Mrs. W. was very upset about the report card David had just received. A few days later she wrote as follows:

"David is showing a definite improvement in his oral reading. He has always refused to read for his relatives, but a short time ago he read to his two-year old cousin, and a few days ago he read for his aunt and uncle. He read nine pages and did very well, but toward the end he got tired and skipped and reversed so they too could see his past troubles. Yesterday he was thumbing through BOYS LIFE. Suddenly he was chuckling to himself, and when I asked what was so funny, he read the sentences under the cartoons to me. So, he is discovering the fun of reading!

"I have made a reservation for him at a summer camp. His teacher thinks he should again be in remedial reading summer school, but I cannot feel this would be the right thing for him. He failed there before. It seems odd to me that his teacher would recommend it when I can see such a big change in his reading ability. If he is in town, his teacher will insist that he go to summer school, and the summer camp will eliminate this problem."

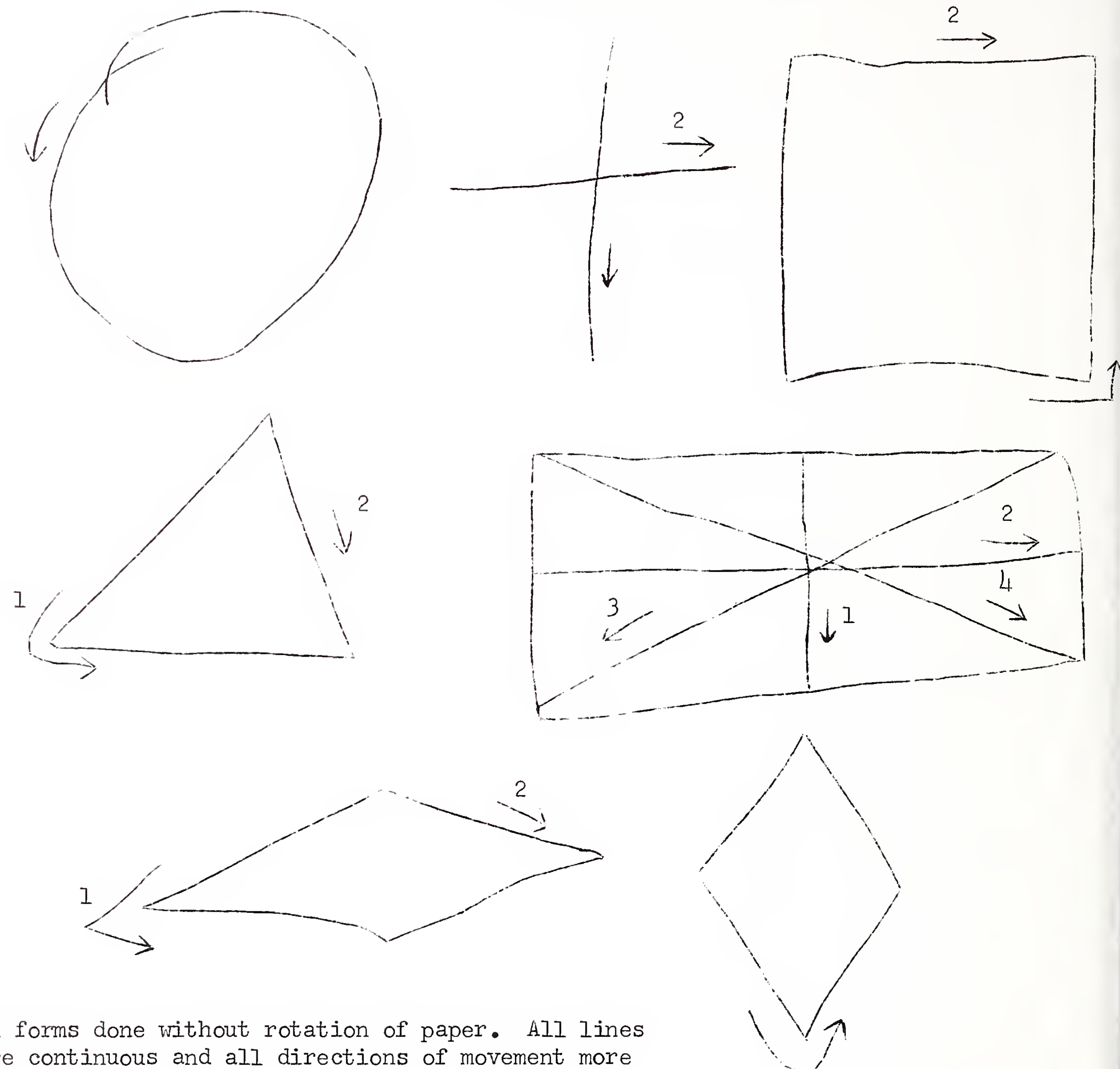
Mrs. W. felt that David needed some help in reading and found a friend who would assist him. The individual attention and choice of material according to David's interests had brought further gains. A conference with this tutor brought the information that David was continuing to make rapid gains. His tutor reported that she could see a number of improvements in basic reading skills as well as improvements in general ocular behavior.

David's performance during his last examination was put on the Operational Vision Scale (see Fig. 2). The Profile is now more in keeping with developmental sequences, which can lead David into more adequate visual performance in the classroom. David still has some further gains to make, but because of a visual guidance program based on the developmental philosophy, he has moved rapidly toward more satisfactory achievement levels. Perhaps lenses alone would have assisted David. On the other hand, the indications are that a pair of glasses would not have solved the problems David faced, which were preventing his being a comfortable, happy, and successful student. There are many details of this case not reported here because of a lack of space. The correspondence between David and the optometrist (as a further method of arousing interest in words on paper) tells a story that would need little comment.

The manner in which David cooperates and participates in a standard Analytical examination could be another story. If these OEP pages could be a talking book and could present David's behavior in the optometric office, everyone who heard would be immediately aware that the

earlier David and the later David were almost two different boys. Helping a child to succeed in our culture is a challenge worth meeting. It only takes a few Davids to make the trials and tribulations of today's optometry seem insignificant.

Series 5 of these Operational Vision Papers starts next month. In this series actual cases, and the disposition of each, will be continued. Discussion of training routines and their place in the developmental philosophy will be explored in presenting these cases.



All forms done without rotation of paper. All lines more continuous and all directions of movement more definite.

David W.
on P.R.

FIG. 1. Visual Forms

OPERATIONAL VISION SCALE

Name: David W. Age: 10^4 Date: Second Scaling

Area	Function	Unrelated ~~Segmented~~			Unorganized			Inadequate ~~Immature~~			Integrated		
Visual Organization — Freedom To Abstract & Synthesize	Emergent Vision							X					
	Comprehension Level							X					
	Concept Visualization						X						
	Descriptive Speech							X					
	Auditioned Speech								X				
	Visual Space						X						
	Visual Size							X					
	Visual Form									X			
Motor Patterning — Freedom To Move	Visual Circuit Consistency							X					
	Oculo-Motor Patterns								X				
	Eye-Hand Relationships							X					
	Fine Motor Patterns							X					
	Body Scheme								X				
	Reciprocity of Organismic Halves							X					
	Gross Motor Patterns										X		

Summary: David has made splendid gains in general motor patterning and motor skills. His syndrome shows the effects of the emphasis on the gross motor activities, and the increased freedom to move is reflected in the improvements now evident in his freedom to abstract and synthesize. He now needs more specific visual training in the eye-hand, oculomotor and form, size, space processes.

FIG. 2. Operational Vision Scale